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VOL. XXXV

JANUARY 30, 1990

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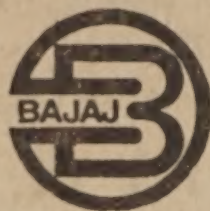
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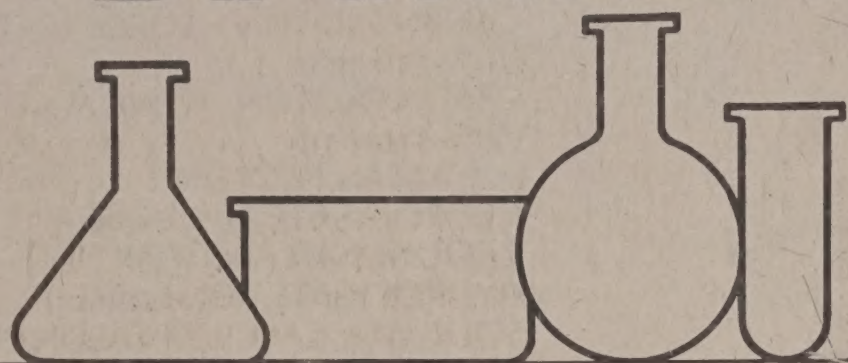
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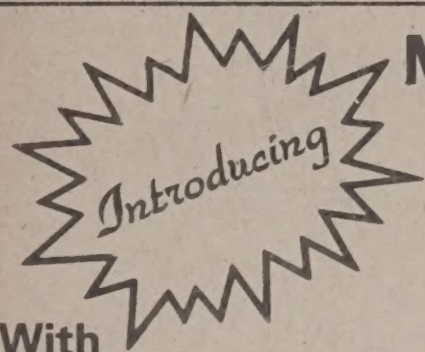
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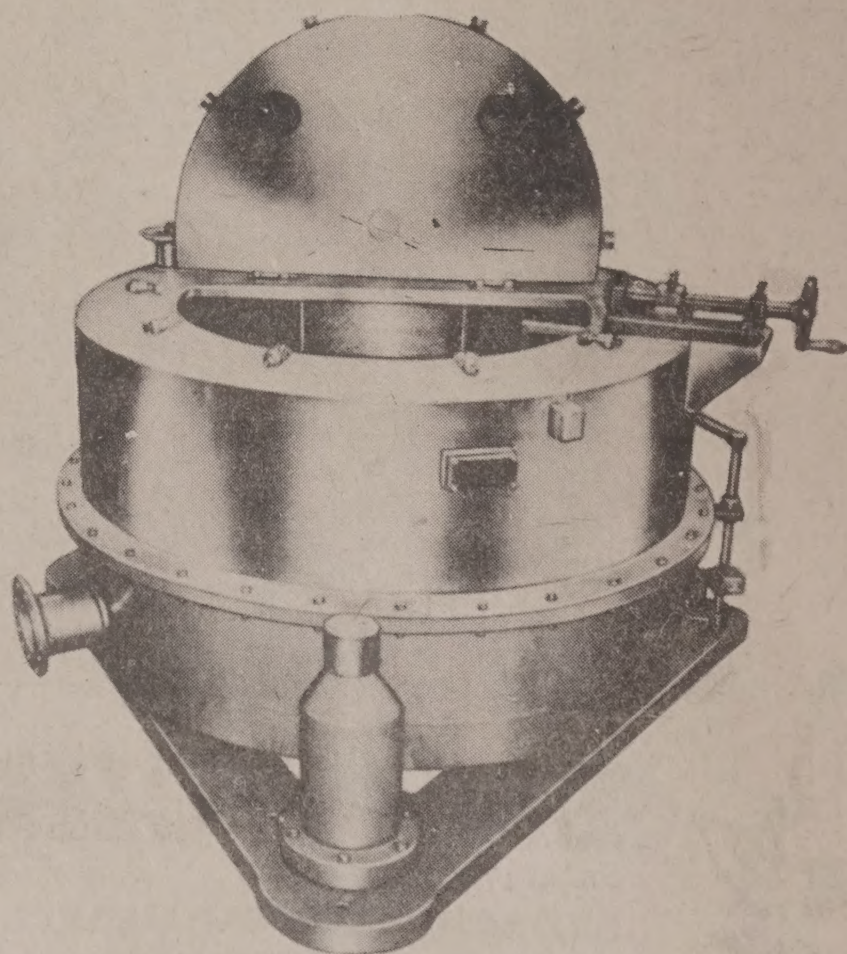


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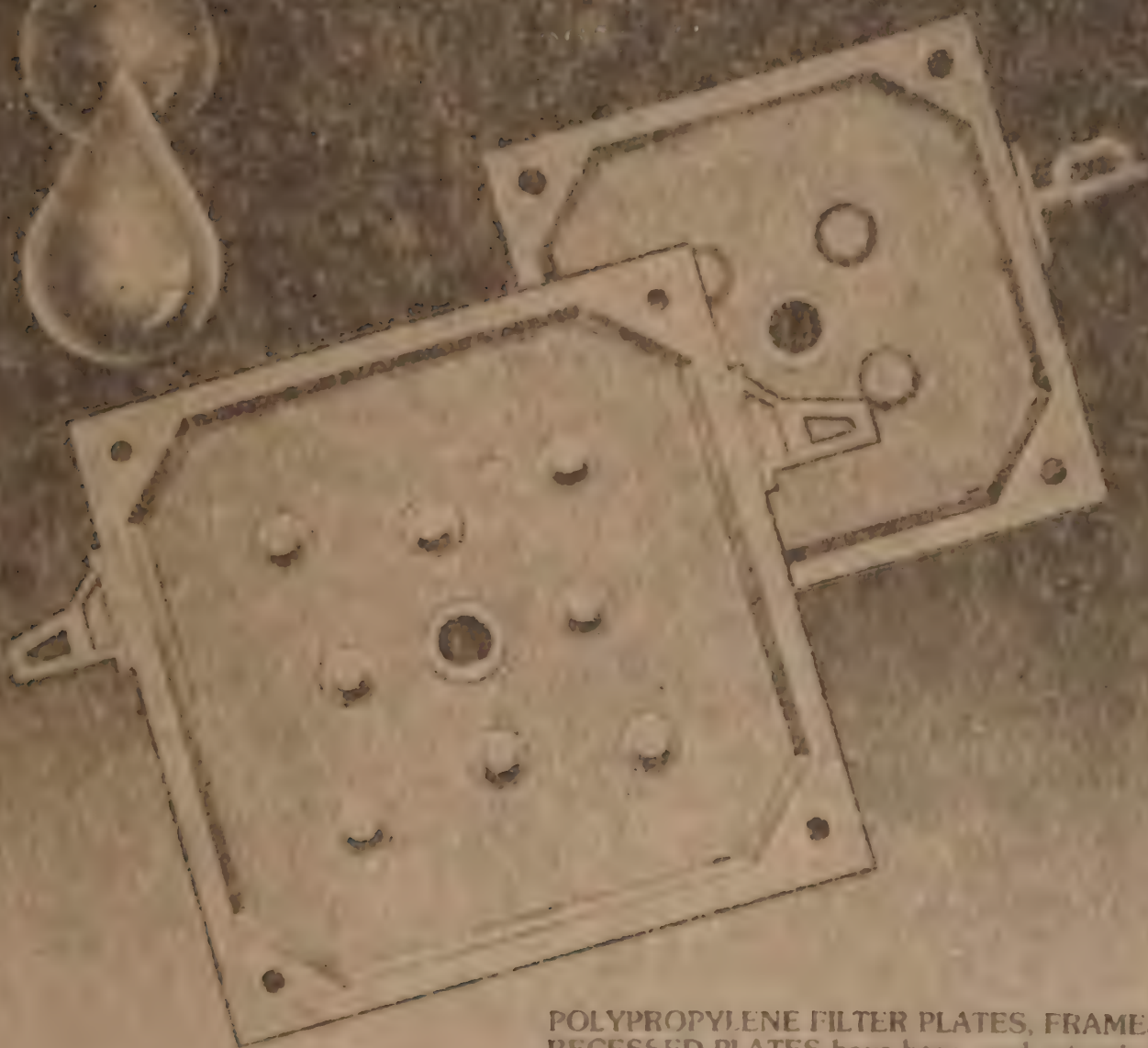


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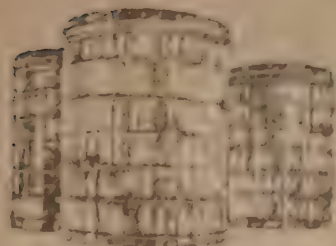
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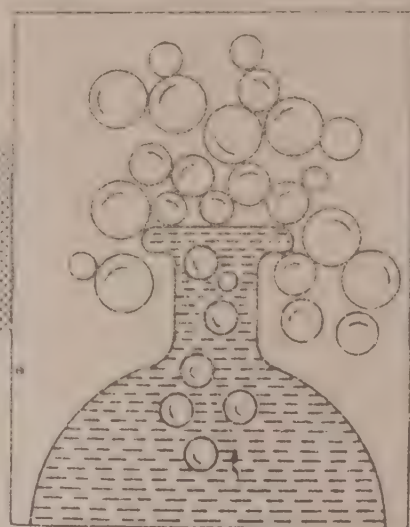
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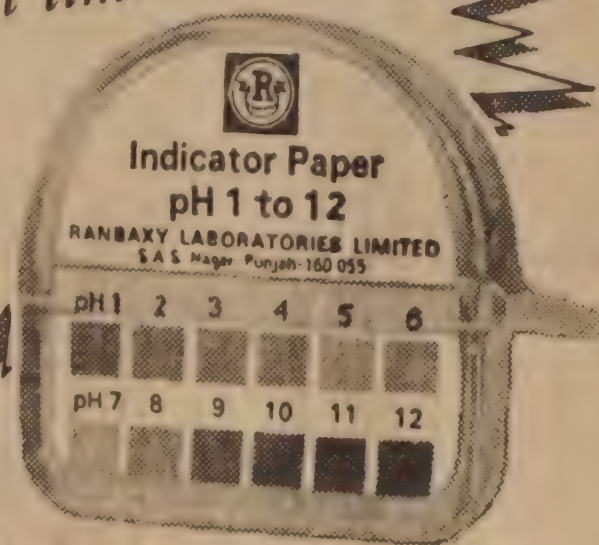
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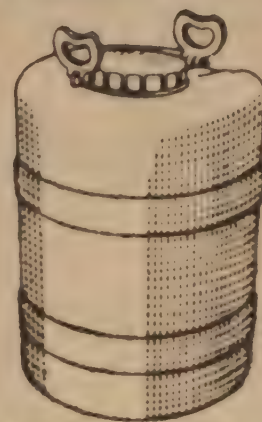
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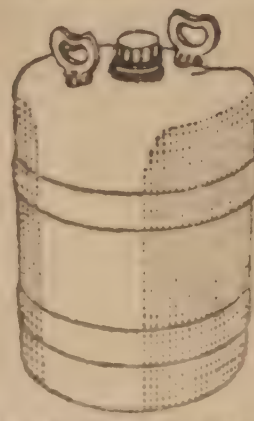
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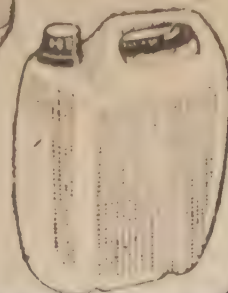
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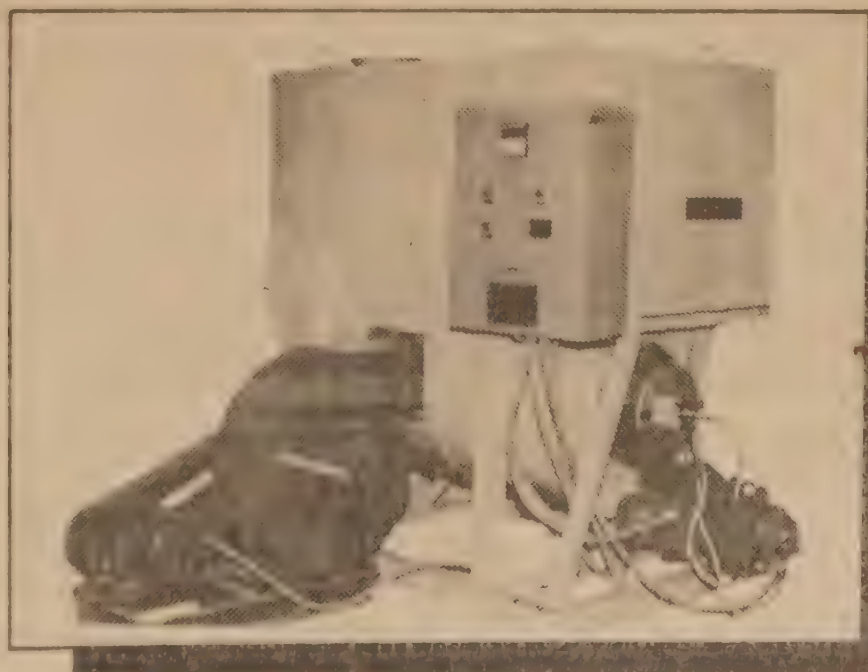


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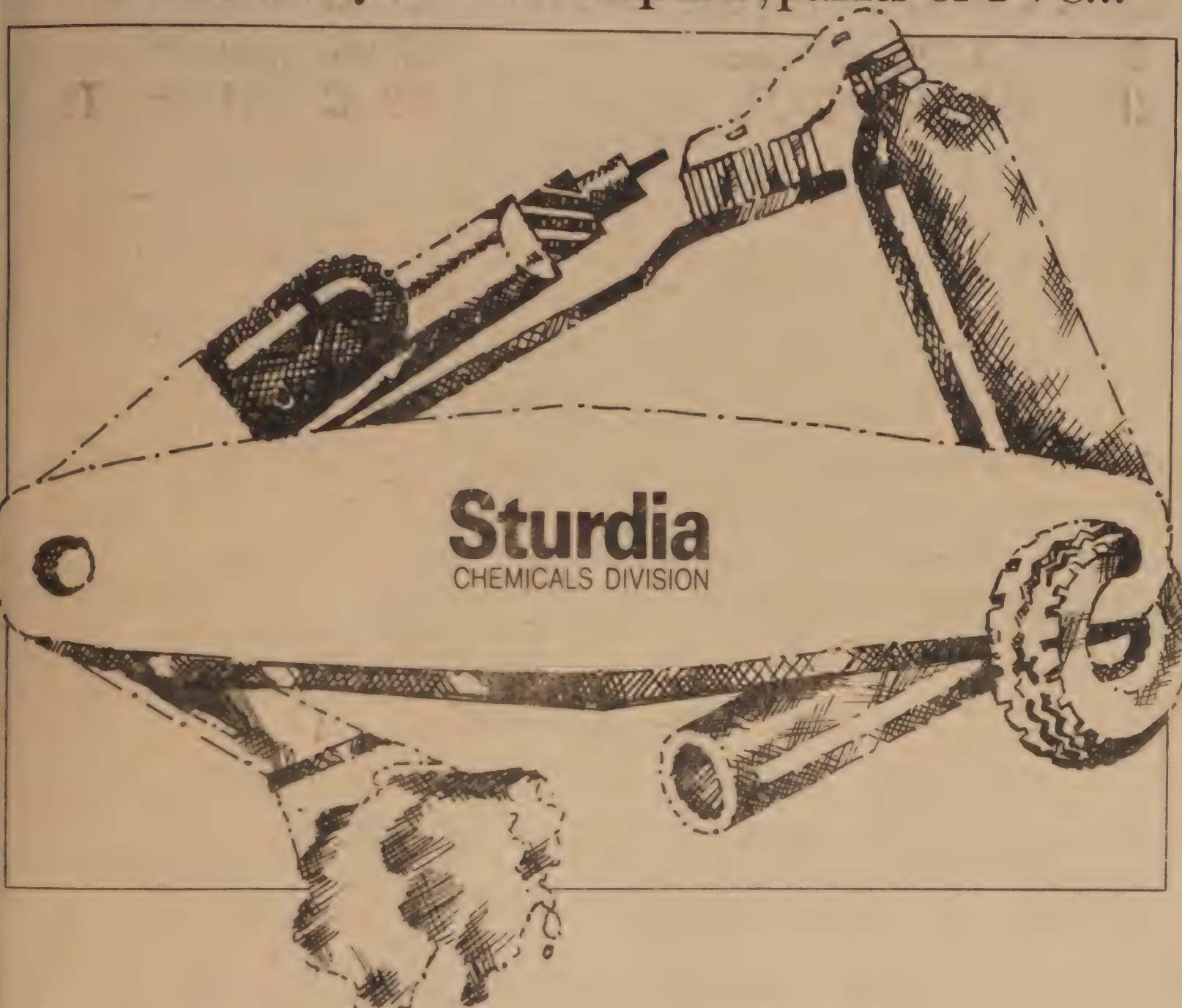
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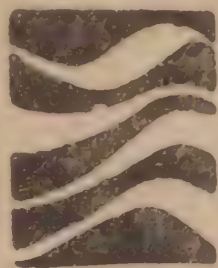
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HERALDING THE 21st CENTURY - 36

The Commercialisation of Space

As the United States vies for leadership status as a space power in the 21st Century, as a nation it realizes that military and commercial space endeavours have a symbiotic relationship. Without a strong commercial space endeavour, the United States will be unable to support economically, and perhaps technologically, a major military space presence. In turn, robust, space-faring military will be essential to protect the economic lifelines of the future space commerce.

During the next century the world will most likely see: (i) nuclear power stations in orbit that will absorb solar energy and beam it down to earth, where it will be converted to electricity; (ii) the mining of the moon and asteroids, which will produce most of the raw materials for the construction of space stations and settlements, and from which earth will receive the major supply of precious minerals and raw materials; (iii) the development of automated factories and scientific laboratories in orbit; and the first colonies on the moon and space settlements in orbit. Those who control these space-based enterprises at the close of the 21st century will likely be the dominant economic influences on earth.

Today's Space Money Makers: Today, communications are the primary money maker for non-military applications in space. Additional revenue-generating activities in space in the near term (pre-2010) will be derived from transportation and support services, manufacturing and remote sensing.

Transportation and support services currently involve the launching of satellites, which has already resulted in stiff competition among several organisations, including those of NASA, the USSR, the European Space Agency (ESA), the Chinese and Japanese, and several emerging private enterprises in the United States and Third World national efforts. In the turn of the century will also yield significant business in in-orbital maintenance and servicing of satellites, the retrieval of satellites for earth refurbishment and the transport of satellites and equipment into different orbits.

The zero-Gravity of space provides an optimal environment for producing large quantities of certain materials and pharmaceuticals. On earth, simulating such environments is more expensive and results in vastly inferior products. Besides the environmental benefits derived from manufac-

undertaken without hindrance of traditional management and labour inefficiencies or parochialisms.

Imagery and other data derived from remote-sensing techniques will have impact on a wide range of earth-based activities. The exploration for terrestrial natural resources will primarily be derived from space-based sensors. The fight against acid rain, depletion of the ozone, the dwindling Amazon and other environmental concerns will be monitored from space. New weather satellites and enhanced processing techniques may add some credibility to weather forecasts.

Two relatively near term areas of commercial space endeavour that deserve special mention are the space processing of medicine and the commercialization of remote sensing.

Space Processing of Medicine: Down to earth concerns with health care can be dramatically aided by heavenly business ventures projected to occur over the next two decades. McDonnell Douglas and Johnson & Johnson have initiated a joint effort to produce a single space drug, which is estimated to generate over \$1 billion in annual sales by the mid-to-late-1990s. Plans are for near-term development of a large commercial pharmaceutical factory spacecraft that would eventually become part of space station Freedom. McDonnell Douglas is exploring processing additional drugs with other pharmaceutical companies and expects to be producing ten different celestial medicines by the turn of the century.

Mass quantities of hormones can be produced in space from the electrophoresis separation process. This is where biological matter is removed from its surrounding medium by passing a fluid between walls that are emitting an electric charge. On earth, the convection forces caused by gravity limit cell movements, hindering the separation. In prior experiments on earlier shuttle flights, a four-to five-fold increase in medicine purity has been demonstrated by space processing.

McDonnell Douglas has also been pursuing other space-based medicine ventures. It has teamed with Washington University in St. Louis, MO, to research a space pancreatic cell separation in order to find a possible cure for diabetes. In joint discussions with the Lovelace Medical Foundation, the utilization of a space processing capability for developing new

research involves the production of monoclonal antibodies in space. The monoclonal process involves fusing harmful cancer cells with antibodies, producing cells that fight the disease.

Remote Sensing: Remote sensing technology for detecting new yields of rare metals, fossil fuels and other scarce natural resources is just coming of age. For two decades the United States has led the world in land-sensing commercial applications. France, the Soviet Union and Japan are offering competition in this area.

The French and Japanese governments pay most of the cost of orbiting their remote-sensing satellites, allowing commercial ventures to reap the profits of gathering and processing the imagery, without paying the hundred of millions of dollars in satellite costs. Only the United States is trying to commercialize both ground processing and space operations. In order to achieve competitive success in the long term, the U.S. government will remain an active supporter of remote sensing.

The Soviet Aerospace Programme: The Soviets are by far the strongest challengers to the US. Their recent successful precision launch and recovery of an unmanned space shuttle (which appears to be a carbon copy of the U.S. shuttle design), bespeaks their grasp of this technology. They hold a clear lead in access to space with dependable launch vehicles, and in manned flight. They have the only operating space station, the most comprehensive remote-sensing system, the best quality commercial high-resolution satellite photos for sale, and have begun to market satellite communication services for half the price of the West's INTELSAT. The largest rocket being developed today is the Soviet Energiya.

The ESA, largely dominated by France but consisting of 12 other European members, has become a significant space player. It has developed its own launchers (the Ariane family of rockets), as well as a spacelab manned laboratory module for use on the U.S. shuttle. Its other programs include the Columbus manned module for the international space station, a free-flying orbital experiment platform and the minishuttle/spaceplane, Hermes. West Germany has become the world's leader in microgravity research an essential ingredient in space manufacturing. Italy's domestic satellite, Italsat, incorporates technology rivaling NASA's Advanced Communications Technology Satellite.

China has created a space infrastructure centered on its dependable Long March series of rockets. It has launched over 20 satellites and, besides the superpowers, is the only nation capable of recovering payloads from space. It has plans for a more ambitious program, including manned flights. Japan, the economic superpower, will by 1992 fly its own-built H-2 launcher, comparable to the Ariane 4 and the Atlas-Centaur. Japan's commercial communications satellites are more advanced than those developed in the United States and Europe, and it is pioneering new technologies for remote sensing. Japan is vying with Germany for leadership in microgravity research, and has begun its own space shuttle effort named Hope.

Mining Space's Riches: As the lure of rare spices sent Europeans across vast oceans to new lands, so may the yield of extraterrestrial minerals serve as a catalyst for space voy-

agers. Projections for the 2020 time frame portray with increasingly intense competition for scarce resources. The Apollo missions revealed that the lunar surface contains many common, but useful, elements. These include aluminium, silicon, oxygen, titanium, iron and calcium, but still useful, amounts of boron, gallium, potassium, phosphorus and rare earth elements have also been found. Four metals other than iron are rare but may be found in meteor strikes. Most of the lunar ores can be stripped from the surface. Lunar ores can also be used for the production of glass, fiberglass, ceramics, semi-conductors, metal sheets and honey-comb metal sheets and composite materials and boron-fiber reinforced ceramics.

Lunar materials should be the foundation for moon construction. Each pound of material that can be produced locally on the moon means saving a pound of material that would have to be imported from earth. Not only would lunar materials benefit moon construction, but they also would be economical for building low earth orbiting stations and processing orbiting space factories. With only one-sixth the gravity of earth, lifting off materials from the surface of the moon would require much less energy than from earth. A pound of material costs \$1,000 to launch from earth, compared with only 10 cents when launched from the moon.

Between the orbits of Earth and Mars lies the asteroid belt where the 21st century Gold Rush will take place. Astronomers estimate that many of the 500,000 asteroids in the belt include those less than one-tenth of a mile in diameter that yield rich veins of valuable ores. The extraction process would be relatively simple and could be performed remotely by robots. The minimal gravity would make transportation very reasonable. Planetary scientists believe that asteroids contain high yields of cobalt, platinum, silver, gold and a number of materials considered to be strategically valuable, making the future world economy dependent on the availability of space miners.

The United States Congress has often emphasized that maintaining the leadership in space is essential for the maintenance of the nation's economic and military competitiveness.

Our vision for space should not simply be a plan for the destruction, but rather for building up of global economic infrastructure. The United States must be the leader in space-based advanced materials, chemical and medicine production.

The space station is not an end in itself; rather, it should be a tool to create new industry for the world.

Exploration of the solar system should be treated as a continuous, ongoing program. Progress may be incremental at times, but it should never be put on hold, leading to a regressed space program that we have today. A strong effort must be aimed at exploring mining and settling the moon, Mars and the asteroids over the next century. For a manned mission to Mars, preferably as a joint world effort, should be taken, in part as a measure to enhance peace and understanding. If this is not possible, then the manned trip to Mars should be a venture of the United States and its allies, to be achieved near the turn of the century.

-- T.P.S. RA

(Condensed from an article by Dr. E.D. Copper and S.M. Slaker in *Defence & Diplomacy* (August 1989))

CHEMARENA

S.L. VENKITESWARAN

Dam projects and their impact

There are two items of recent news and announcements likely to have great impact on our development strategy for the years ahead. This is on the controversies over the two mammoth dam projects—Tehri Dam in the Himalayas and the Narmada Sagar in Madhya Pradesh-Gujarat, both started after years of uncertainty.

Tehri Dam is reportedly in a quake prone area and expected to inundate vast tracts of forest land. Expected to cost over Rs.800 crores it is primarily for electric power generation and in a country badly starved of electricity and increasingly obliged to use coal, oil/gas and nuclear sources with equally serious impact on the environment. Tehri Dam seems to have been studied by a World Bank Team which came to the conclusion that it was not a viable one on investment/returns basis. The present focus on Tehri Dam is due to the frontal attack by the well known Sri Sunderlal Bahuguna who originated the Chipko movement for preventing the destruction of prime forest land. He was on fast to death at the dam site before the Government of India agreed to halt the work and reexamine the environmental aspects. But counter protests have resulted in the decision of the UP Government to go on with the work and Mr. Bahuguna's fast has been resumed. Is it not possible even at this stage to take a fresh look at a mega project of this nature and see if modifications are at all feasible and to reassure the public mind?

The Narmada Sagar, the nucleus of the Narmada Project is under deeper troubles. The Narmada Sagar is not only to inundate vast tracts of prime forest land but displace thousands of people who depend for their very existence on these forests and their produce and have thus lived on for centuries. The cost of rehabilitation of thousands is enormous but even more so is whether such adivasi folk would survive in the different conditions. The World Bank has sanctioned financing of this dam and seems to have assured itself that the measures for rehabilitation are satisfactory. It is a power plus irrigation project with far more emphasis and returns from irrigation benefits apart from flood control. The total cost of the Narmada Valley project is to run into Rs.10,000 crores over a period of 15 years. The benefits are largely for the downstream state of Gujarat while all the environmental impact and displacement of people is in Madhya Pradesh. While the previous Chief Ministers of M.P. were adamant on going ahead, a new chief has in his first public statement described the project as "criminal, mindless and unfit for exe-

cution". There was a massive demonstration recently in the town of Hirsud (of a few thousand population) which is to be obliterated by the water. The entire population is to be settled elsewhere but many are not interested and have raised banners of revolt. The new Minister for Environment of Govt. of India was at the massive demonstration. Forest land is too precious a heritage and has far more benefits than as a provider of fuel (which can be from alternate sources). "Social forestry", is no substitute for prime forest lands but only a provider of fuel wood. Decrease in height of the dam can certainly save thousands of hectares of forests and crores of rupees in rehabilitation of displaced people. For Gujarat the Narmada Sagar has become a political issue though the location is in the upper riparian state of Madhya Pradesh.

Is there no reasonable compromise which could be worked out even at this stage?

In this context it is useful to recall the fate of the "Silent Valley" project for electric power generation in Kerala. This economic and viable project was the subject of extensive controversy over the prime biosphere area which would be submerged (not any extensive forest land) or destroyed by the human activities in this otherwise impenetrable area. It was the view that the only tropical area with high rainfall and serving as a natural source of evolution of plant species will be lost. The arguments that much of this area could be left intact by limited and restricted access to the project site were turned down and the Silent Valley remains a mute witness of the untapped potential for cheap hydro power. Perhaps Kerala State does not have the same clout as U.P. or Gujarat. Even the premises on which the project was shelved have not been studied in detail to justify the possible disruption of the bio evolution.

The same Madhya Pradesh Chief Minister who condemns Narmada Sagar is anxious to go ahead with Bodhghat Project in the same state but in a Western Adivasi area although such a project was severely criticised by experts and the environmentalists because it would disrupt the life styles (even though primitive) of many thousands of Adivasis and even the World Bank raised objections. Apparently there are no clear yardsticks to assess the impacts of these multipurpose mega projects associated with serious disruption of life of lakhs of people and on the environment. Even experts of the World Bank have varying standards.

Moving away from India there will apparently be an inevitable holocaust in Brazil if the present practice of burning and destroying rain forests to ashes to enable cultivation and settlement of lakhs of people persists. It is reported that 12350 square miles have been ashed and the pace of destruction is increasing every year. The thick forest cover of the upper Amazon basin extending to 2.7 million square miles is said to be the world's greatest pharmaceutical laboratory with its rich and varied plant species. Our Silent Valley is nothing in comparison. The worst scenario is of climatic chaos when the 170 billion gallons of rain water per hour could not be held back by the vegetation and go hurtling down into the river. Even the cleared areas are not properly cultivated and get reduced to yield poor crops and the settlers seek new pas-

tures to burn. The industrialists on their part cut down to make charcoal by wasteful burning for supply to blacksmiths to make iron. The evolving tragedy in the Amazon valley is a matter of global concern and environmentalists are anxious that the destruction is halted before it becomes irreversible. There is no power generation or irrigation to justify such action. It is understood that Brazil is being offered a progressive write off of a part of their immense debt (\$110 billions) as an incentive to stop this wanton destruction of prime forest land.

India's aggression on her environment and problem of earning a livelihood from forests and trees is much milder in Brazil but high time for some rethinking.

Haldia Petrochemicals and the new suitors

As mentioned earlier the green signal and foundation stone for Haldia Petrochemicals has led to keen interest of the top private sector parties for partnership. This is a happy augury but basic changes in concept and uncertain financing patterns should not lead to further delay and cost escalations. We again find a reversion to the earlier concept of "mother" cracker and downstream projects with different ownership. The NOCIL project had tie ups with two different partners—one of these only for HDPE - but the Indian party was the same. IPCL discarded this approach of "umbrella" concept and opted for a single public sector company for the total complex. It is also proceeding in the same way for the second gas cracker complex and is set to adopt the same policy for the third complex at Gandhar which has been assigned to it. Reliance was also allowed to take over all the downstream products of the Gujarat Gas Cracker and earlier approvals of some of these to other parties were withdrawn — on the same parallel of NOCIL and IPCL being under one ownership.

It is reported that W.B. Government will be the partner of the total complex and while the Goenka group will continue to be its partner for the cracker and one or two downstream plants, another partner will be chosen for other downstream projects. This exercise must not be prolonged nor delay the work on the cracker to be taken up.

It is intriguing to find some comment that we should stick to gas crackers and not turn to naphtha. But apparently this concept seems to be directed at Haldia which it is suggested should be shelved. If we should stick to gas cracking there

was no justification for the NOCIL "expansion" or for approval of other two projects proposed at Vizakhapatnam and Madras. Gas cracking has no doubt the highest priority for the ethane/propane feedstock is otherwise wasted or flared away; this is also the reason for higher priorities for Gandhar, Jagdishpur and Auriya. We have the tendency to close arguments favouring one particular programme as against another in pseudotechnical attire. If petrochemicals are "unwanted" it applies to all projects and not to a specific ones such as Haldia. There is apparently too much consideration of aspects other than technical or feedstock based advance specific projects — a tendency which is all too common when projects are decided on extraneous considerations and ruled out as happened to Haldia for over a decade.

The NOCIL project has also come under attack again from the environmental groups and the Minister concerned has called for a review of the approval already granted. There has been a well argued defence of the location in Trans Thane Creek and that pollution levels will not rise with the four fold expansion as adequate measures will be included. The NOCIL argument is also that the project is well covered for its foreign exchange needs without any drought on the country's balance of payments for servicing of debts. But question of raising overseas equity to 40% or more in the project so as to cover the foreign exchange requirements is a basic question, which requires prior decision.

We seem to be still unclear on our objectives and immediate targets on petrochemicals.

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BPCL's extraction plant commissioned

A Rs. 16.5-crore plant constructed by Bharat Petroleum Corporation Ltd. (BPCL) for extraction of hexane from the Bombay High crude using the pollution-free sulpholene process has been commissioned.

Announcing this at a press conference at Bombay recently, Mr. K.R.S. Narayan, BPCL's director (refineries), said that the plant has an annual capacity to produce 25,000 tonnes of hexane, which is enough to cater to about 40 per cent of the country's soaring demand for hexane required by the solvent extraction units. BPCL has already begun working on a plan to double this capacity. The only other producer of hexane in India is Hindustan Petroleum.

BPCL has also commissioned another Rs. 23-crore plant to produce 50,000 tonnes of propylene every year for supply to the Maharashtra Gas Cracker Complex at Nagothane through a pipeline which is under construction. As against the targetted parameter of 55 per cent purity, BPCL has been able to achieve 75 per cent purity in its propylene product. BPCL has also entered into an agreement to supply about 30,000 tonnes of naphtha to Reliance at Patalganga, according to him.

Another recent achievement of this public sector giant is the commissioning of a 25 mw co-generation plant using the GE technology. The project was implemented by another public sector giant, BHEL. This plant would be able to take care of the BPCL refinery's full power requirement which is about 18 mw. BPCL has a plan to set up another 25 mw co-generation plant and to supply power to the state power grid at a competitive rate. (It costs only 55 paise per unit to cogenerate power, according to a BPCL spokesman)

Mr. Narayan announced that BPCL has been able to reduce air pollution by the refinery in a big way by adopting advanced pollution control measures. It

has also set up a sophisticated air pollution monitoring unit. Among BPCL's projects in the pipeline are: Rs. 35-crore project for maximisation of benzene extraction at its aromatic plant (to be completed in 24 months); Rs. 35-crore project to modify the cat cracker debottling unit (15 months) and a Rs. 16-crore project to reduce biological oxygen demand to the minimum international standard (Minas) (to be completed in two months).

BPCL is expecting clearance of its Rs. 120-crore project for extracting N-paraffins from kerosene by the Public Investment Board soon. The project is to be implemented within 30 months. It has already obtained environment clearance for its Rs. 375-crore project to be located in Bombay. Similarly it is also hoping that its Rs. 2,600 crore Central India Refinery (to be located near Bhopal) will be cleared by PIB.

IPCL'S XYLENE CAPACITY TO BE RECOMMISSIONED

The production of ortho-xylene will

be increased from 21,000 to 32,600 metric tonnes per annum (MTA). para-xylene production would increase from 17,000 to 32,600 MTA, recommissioning of the India Chemicals Limited (IPCL) xylene plant. The revamping and expansion of the plant has been done at a cost of Rs. 10 crores. Production of xylene resumed for the hook up since August last year according to Indian Petrochemical Corporation limited press release.

The production at the indigenous capacities is however expected by March this year and will help in saving the foreign exchange spent on importing xylene. IPCL will consume 2,000 tonnes of para-xylene for industrial use and the balance will be available for sale, the release added.

The revamped xylene plant will make available quantities of solvent grade xylene for the pesticides sector, paint industry and the speciality chemical field. The revamping process is highly energy saving because of heat integration and use of high yielding indigenous catalysts.

Tatas to set up Haldia project: RPG may get downstream units

The Haldia petrochemical project will be set up jointly with Tata Tea Ltd., the West Bengal Chief Minister, Mr. Jyoti Basu, announced in the State Assembly on January 24. Making a statement, he said the State Government had assessed 10 proposals and decided to have a joint sector company with Tata Tea.

He said 26% of the equity would be held by the West Bengal Industrial Development Corporation, 25% by Tata Tea and its associates. The remaining 49% would be held by public and financial institutions.

Mr. Basu said the joint sector com-

pany with Tata Tea would set up naphtha cracker plant and the major downstream products such as HDPE, HDPE/LLDPE, styrene, polystyrene, butene-1, butadiene and acetylene black.

He said the State Government was considering the possibility of forming another joint sector company with Mr. R.P. Goenka, the original partner in the joint sector, to set up import downstream units using styrene, butadiene and C4-raffinate. The possibility of setting up further units under the joint sector company on the basis of ethylene and propylene was also being considered, he said.

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H.L. ROY — 'HIRA' OF A MAN

HLR, a 'gem' of a man, what an apt name - Hira Lal Roy. I knew HLR rather well and closely during my years in Calcutta, 1957-1963. With another doyen, Dr. G.S. Kasbekar, I was intimately involved in the Institute's affairs and used to meet HLR often for advice, to hear words of wisdom and otherwise just to relax. This is the period when Kasbekar and I set ourselves and met the challenging target of doubling the Institute's membership from some 500 to 1000 in a couple of years, thanks to HLR's guidance. On the occasion of HLR's birth centenary, I would like to share one very personal and as far as I know hitherto unreported thought of this great man. More than a thought, it was a 'fear' — expressed to me repeatedly, specially during April 1963, when I was waiting to shift to Bombay, and was temporarily staying at Jodhpur Park, very close to HLR's home. I used to just walk over to his place for inspiration and just to be with him.

In regard to the Institute's affairs and management, HLR was most unhappy that the Institute and those closely connected with its affairs were rather 'parochial'. This word he had used so often, not once but many a time at each of our meetings, that it is the first word that comes to my mind whenever I think of this great man. Later events proved him absolutely right. Let me relate just two incidents. FIRST one occurred at the Institute's annual meeting at Durgapur in the last week of December 1965. Thanks to the initiative of Dr. G.P. Kane and other senior members, I used to host an informal get-together on the eve of the first meeting of the new Council. Just a social affair to arrive at a consensus for the next year's office bearers. Talk was free and frank and the consensus was always carried by the new Council, i.e., always except at Durgapur. At the last minute a surprise was

sprung by the Jadavpur group, in the form of coopting of the senior members to the Council and in the same breath proposing his name as President. We were all taken aback but I must say that, as always, Dr. G.P. Kane was very calm in 'reading' the situation — before I could even fathom to what was going on. It was a 'tamasha', and I can't think of any better or more appropriate word for it. The very people who were party to the consensus conveniently forgot what they had agreed to the night before. Thanks again to Dr. Kane's foresight, a crisis was averted and a formal vote was avoided. But the whole affair left a bad taste, and perhaps ended a healthy tradition — all because of parochialism. HLR had warned me about. On occasions such as these I am left wondering whether there is any such thing as human conscience, and whether it pricks one when the person completely betrays his own agreement and deliberately

SECOND incident happened in New Delhi just a few months ago, when I called on a very senior member of the Institute, one very close to HLR — in fact living in the same home, or next door. Just a courtesy social call and in the course of our visit he mentioned that he was working on a commemorative volume to be brought out on the occasion of HLR's birth centenary. He was disappointed at the poor response to his request by a large number of persons who he thought knew HLR personally and well. Of course, I was not on his mailing list, but he did have the courtesy to ask me for a contribution. I agreed reluctantly but expressed my reservations that he may not like what I might send. To refresh my memory, I even recalled the Durgapur incident with its parochial 'wheeling and dealing', for he himself was a party to

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of repute. His recent title: CAPITAL COST ESTIMATING FOR THE PROCESS INDUSTRIES, (Butterworth, 1988). Forthcoming titles: (All with Mr. E.A. Stallworthy) WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY (Gower, 1989) & PROJECT TEAMS — THE HUMAN ELEMENT (NTL. COMPUTING CENTRE, 1990). Available from Vivek Enterprises, 5, S.K. Barodawalla Marg, Bombay 400 026.

I often wonder whether HLR would have approved of even be a party to having the Institute's permanent headquarters at Jadavpur. New Delhi is a far better and neutral place for this, although Jadavpur justifiably can claim that it was the birthplace of the Institute. Going by numbers, Bombay is the logical choice. But all this is now history though it is refreshing to recall it, in memory of the great Hira Lal Roy.

An endless wait for MGCC

The Maharashtra Gas Cracker Complex (MGCC) of Indian Petrochemicals Corporation Ltd. (IPCL) is dressed up with nowhere to go. Its commissioning has been postponed indefinitely because of delay on the part of Oil and Natural Gas Commission in providing C2, C3 fractions. The cracker was originally to have gone on stream in December. The feedstock for the Rs. 1,900-crore project was to have been 4.5 lakh tonnes per year of ethane/propane from a gas fractionation plant to be set up by ONGC in Uran says a report in the Financial Express.

Col. S.P. Wahi, ONGC's former chairman, was never tired of saying that gas was being flared because there were no takers. It is ironical that delay on the part of ONGC is standing in the way of commissioning of India's first gas cracker unit which would have produced a host of import-substitution products.

To supplement supplies from ONGC, Bharat Petroleum Corporation Ltd. (BPCL) was to supply 51,000 tonnes of propane/propylene a year from its Mahul refinery in Bombay. While no one knows when ONGC's facility will go on stream, BPCL's facility to supply 50 tonnes of propylene every day to MGCC has been ready for commissioning since March 1989, but has been lying idle. BPCL has invested about Rs. 20 crores in the project. The pipeline to transport propylene to Nagothane was also not been completed.

Indeed, IPCL appears to have foreseen the delay on the part of ONGC and played with the idea of cracking LPG with a view to commissioning the cracker on time. This was not implemented, probably because LPG is a sensitive subject, a consumer item for which the country is heavily dependent on imports. It is noteworthy that for its second gas cracker based on Gandhar gas, IPCL will be taking the gas from ONGC and setting up its own fractionation unit, perhaps to avoid the MGCC

experience. MGCC has a capacity to produce three lakh tonnes of ethylene, which is to be upgraded to four lakh tonnes in due course. This expansion is, however, subject to a review being conducted by the Petroleum Ministry. The following is the product-mix based on three lakh tonnes of ethylene. LDPE 80,000 tonnes, LLDPE/HDPE 1.35 lakh tonnes, ethylene oxide 10,000 tonnes, ethylene glycol 50,000 tonnes, polypropylene 60,000 tonnes, acetylene black 1,740 tonnes, butane 1-15,000 tonnes, and wire and cable compounds 25,000 tonnes.

TELK GENERATOR FOR NPC

A 260-mva 220 kv generator transformer for the Nuclear Power Corporation (NPC) for installation in their Tarapur Atomic Power Station, manufactured by the State public sector Transformers and Electricals Kerala

Ltd. (TELK) at Angamali, 40km from Cochin, was handed over to the Atomic Energy Commission Chairman, Mr. M.R. Sreenivasan, at the TELK premises on January 22. Manufactured at a cost of Rs. 2.54 crores, the 180-tonne generator, the largest size being used in India, is to be transported to Tarapur by a special wagon owned by TELK. TELK had earlier supplied similar generator transformers for atomic power stations at Narora in Uttar Pradesh and Kalpakkam in Tamil Nadu. It has also supplied similar large transformers for the Kakrapar atomic power project in Gujarat.

TELK is one of the leading manufacturers of extra high voltage power transformers in the country and has been supplying power equipment to all the State electricity boards, the National Thermal Power Corporation, National Hydro Power Corporation, the Tata Electric Company and other power supply undertakings and railways.

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Inadequate growth in fertiliser output

The output of nitrogenous and complex fertilisers will have to be doubled atleast in the Eighth Plan to 12.5 million tonnes and 4.5 million tonnes of phosphatic fertilisers if an increase in imports has to be avoided. With a big step up in the output of urea and other nitrogenous fertilisers, near self-sufficiency was achieved in 1987-89. The favourable trends in production in 1988-89 were due to the commissioning of five large gas-based fertiliser projects. All these units are functioning efficiently and utilising the capacity fully.

In fact, it was necessary to regulate production in 1987-88 when there was a meagre growth in offtake on account of drought conditions. Following the Thal Vaishat and Hazira mammoth units, three new units having a capability of 1,350 tonnes of ammonia and 2,200 tonnes of urea daily have been commissioned in Bijaipur in Madhya Pradesh, Aonla and Jagdishpur in Uttar Pradesh. But the momentum has not been sustained as the remaining projects of Zuari Agro Industries, Tata Chemicals and Bindal Agro will be taking shape only in 1992-93.

Another unit in Andhra Pradesh may also be arriving on the scene at about the same time. But the demand for nutrients will be rising if the growth in agricultural production is maintained at three to four per cent annually.

Need for doubling capacity in Eighth Plan

As the new Government is keen on strengthening the agricultural sector and boosting production of food and cash crops, it has to be ensured that the output of different types of nutrients is increased steadily for the execution and expansion of new schemes. Though there are differing estimates about the demand for nutrients in 1990-95, it is clear from the assessment of various agencies that there will be bigger gap in availability of all types of nutrients by the end of the next Plan.

The progress in the Seventh Plan will be truly impressive as it is estimated that the capacity for nitrogen will be rising to 9.3 million tonnes from 5.6 million tonnes and for phosphatic fertilisers to 2.7 million tonnes from 1.6 million tonnes in 1984-85. The output also will be increasing to 6.6 million tonnes from 3.9 million tonnes of nitrogen and that of P_2O_5 to 2.2 million tonnes from 1.33 million tonnes in 1984-85. This rate of growth is unlikely to be sustained in 1990-95, as no new plants for additional capacity in nitrogen are envisaged. However, there is a controversy whether it will be desirable to produce complex fertilisers within the country with the dependence on imports of rock phosphate, sulphur and phosphoric acid and it will not be cheaper to import diammonium phosphate and other complex fertilisers.

As sample gas reserves are available and there will also be a surplus of naphtha in different regions, new gas based fertiliser plants will have to be located in dispersed regions with the creation of a national gas grid. As there may be delay in commissioning entirely new fertiliser units, other than the three plants under construction, the expansion schemes of the existing efficient fertiliser producers should be implemented as the outlay will be smaller than on entirely new units. Also, the schemes can be completed in 18-24 months. The proposals of EID Parry, Madras Fertilisers, SPIC and others are still under the consideration of the Government.

Pragmatic pricing policy essential

In view of the need to prevent an avoidable increase in imports in the coming years, quick decisions will have to be taken about the execution of new and expansion schemes under different auspices. The policy relating to pricing of fertilisers also has to be pragmatically conceived as the profitability of working of Indo Gulf Fertilisers, Gujarat Narmada Valley Company and others has not been satisfactory under the

revised retention price formula. Central Government is, of course, worried about an increase in expenditure on subsidy. It may not be inclined to raise prices for nutrients at the retail level when it is being emphasised that farmers should be given a better price and provided supplies of inputs at affordable prices. While it remains to be seen how the conflict in interest will be resolved, it will be readily agreed that the fertiliser industry can effect expansion to its capacity at the desired rate in the coming years only if investment is worthwhile.

-- The H

BOOM IN EXPORTS OF POLYESTER STAPLE FIBRE

There is virtually a boom in exports of polyester staple fibre from the country in terms of quantity and value. The exports have doubled in terms of quantity during the first eight months of the current year (April-November 1989) at 25,918 tonnes when compared with the volume of 12,988 tonnes during the corresponding period of 1988-89.

They have recorded an unprecedented growth of 215 per cent in terms of value during the same period, making the per unit realisation at much higher level. PSF exports have gone up to Rs. 65 crores during the first eight months of 1989-90 from that of Rs. 20.71 crores during the corresponding period of 1988-89. This has resulted in the per kg realisation going up substantially to Rs. 25.18 during the current year from the level of Rs. 15.94 last year. An increase in per kg realisation by 58 per cent over a year is tempting even allowing for around 13 per cent depreciation of rupee during the period, particularly when the local market is not attractive. The upward revision in exports in terms of quantity, value and per unit realisation appears to have gathered momentum during the last few months if the trend in November 1989 (the figures for which are available at present) are any indication.

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CHEMICALS INDUSTRY

Soviet help in technology transfer welcomed

The Petroleum and Chemicals Minister, Mr. M.S. Gurupadaswamy welcomed Soviet help in terms of straight technology transfer or joint ventures on mutually acceptable terms to give a boost to the chemicals industry in India. Inaugurating a seminar on chemicals and pesticides and industries of India and USSR under the auspices of the Indo-USSR Chamber of Commerce and Industry, Mr. Gurupadaswamy said his ministry had prepared a perspective plan for the development of chemical industry in India.

Since Soviet Union had also prepared a plan for development of chemical industry in the USSR by 2000 AD, mutual exchange of views on the subject would be beneficial, he said. The minister said India and Soviet Union could also identify specific projects where joint ventures could be set up in the Soviet Union and in India and possibly in third countries in the field of pesticides and chemicals.

Mr. Gurupadaswamy said, "we do recognise that in spite of rapid developments and improvements in technology of various chemicals in India there are still areas where we either need fresh technology or upgradation". The minister also said the chemical industry the

world over was seen as a potential threat to environmental conservation. "While some of the fears on this account may be exaggerated we have to be conscious of our commitment to maintaining an environment free from pollution and fit for the human race".

Experts in both the Soviet Union and India could consider methods for ensuring safety in the manufacture of chemical products particularly pesticides, he said. "We have to search for methods which are effective in controlling hazards and pollution and are at the same time not very costly", he said. His ministry, while committed to catalysing chemical industry growth, was also equally committed to controlling hazards and pollution, he added.

Mr. Gurupadaswamy said in 1988-89 exports from India to the USSR covering chemicals, drugs and allied products exceeded Rs. 3,000 million which was a significant proportion of the total trade between the two countries which had now grown to more than Rs. 70,000 million. Exports of chemicals and pharmaceuticals crossed Rs. 20,000 million last year, he said, hoping exports of chemicals, agrochemicals and pharmaceuticals would increase further. Earlier, the visiting Soviet Deputy Minister

for Chemicals, Dr. A.S. Chegolov, said co-operation between India and Soviet Union had now to diversify into sectors like chemicals and pharmaceuticals. Hitherto it had been confined to heavy engineering and steel industries, he said.

Chemicals secretary, Mr. M.S. Gurupadaswamy said detailed plans for major sectors of chemical industry had been drawn up as part of the perspective plan for chemical industries in India.

P.K. IYENGAR APPOINTED CHAIRMAN

Dr. P.K. Iyengar, Director of Bhabha Atomic Research Centre (BARC), will be the new Chairman of the Atomic Energy Commission and Secretary of the Department of Atomic Energy. Iyengar will succeed Dr. M.R. Srinivasan, who retires on January 31. An official spokesman said Dr. Iyengar will have a three-year tenure. Dr. Iyengar has been at present the Chairman of the International Radiation Physics Society and several other professional societies. Born in 1931, he did his M.Sc. from Travancore University and Ph.D. from Bombay University. He has spent almost 20 working years with the Department of Atomic Energy. He took over as Director of BARC in March, 1984. His personal specialisation has been in different aspects of nuclear physics.

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PHARMACEUTICALS

Loan-licence scheme to continue

Loan-licence for the manufacture of pharmaceuticals will be permitted till 1993. The practice will continue even after this year in specific cases linked to export and other qualifications, according to Mr. Shyam Suri. This follows the Government's acceptance of recommendations by Dr. Premkumar Gupta, the Drug Controller, who had been assigned to study the issue, Mr. Suri said. Addressing the annual general meeting of the Indian Drug Manufacturers Association in Bombay on January 20, 1990, he said a notification in this regard is to be issued soon.

Mr. Suri was responding to remarks by Mr. N. I. Gandhi, President of Indian Drugs Manufacturers Association. The previous Government had announced its decision to abolish the loan-licence system by March 1990, as part of the measures for rationalisation, quality

control and growth of drugs and pharmaceutical industry." The decision had come as a bolt from the blue to cover 8000 loan licence units, 85% of which were in the hands of self-employed technocrats and marketing professionals.

Defending the practice, the industry had submitted that the system had played a vital role in the development and growth of the industry for more than 40 years. The system is in vogue in developed countries like the US, Japan, the UK and West Germany. Indeed, a good number of large pharmaceutical companies today began as loan-licence units. What was undesirable and the Government wanted to eliminate was the existence of units which do not manufacture anything of their own, but flourish on cent per cent contract manufacture and plan to continue as such. The industry at large agrees that such

units ought not to be encouraged. However, it contends, that a large tableting unit embarking on a small diversification into capsules should be allowed to go for contract manufacture, until the new activity grows large enough to justify the setting up of its own capsulation facility. Similarly, large, unexpected export orders like those from the Soviet Union cannot be executed in one's own plant. The Government now seems to have accepted this argument. IDMA claims that loan-licence manufacturers provide direct and indirect employment to about three lakh people, including ancillary industries. The turnover of these units together is over Rs. 400 crores. The decision to abolish the system had resulted in an avalanche of protest, forcing the Government to set up a committee headed by the Drugs Controller to examine the various objections raised by the industry. The committee had unanimously recommended extension of the system for four years from 1990.

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Standing panel on drug prices being set up

A high-level standing committee on drug prices is being set up by the Government which will go into all policy and practical questions on drug pricing.

The committee is to be headed by the Secretary, Department of Chemicals and Petrochemicals. Members will include Additional Secretaries of other related departments like Health, Biotechnology and the Bureau of Industrial Costs and Prices. It will also take decisions based on the recommendations of the supplementary report on category two reports prepared by Dr. Vijay Kelkar.

To assist the standing committee, three working groups are being created at the lower level to conduct hearings with industry and associations and collect data.

The first working group will deal with therapeutic issues to deal with dis-

ease patterns and categorisation. The second group will take up research and development issues, indigenisation of technology, concessions for R and D expenditure and the like. The third group will study production issues, duty structure and their bearing on prices.

Talking to the members of Indian Drug Manufacturers Association (IDMA) at Bombay recently, Mr. Shyam Suri, Joint Secretary, Department of Chemicals and Petrochemicals, admitted to long delays in releasing price-revisions. The Government is attempting to rationalise the price fixing mechanism. BICP is working on a three-year escalation formula which should enable revision by simple calculation.

On self regulation by the industry, he said the current thinking is to permit the same once a year, but subject to the condition that the company should send

the cost data soon after implement-

If the government found that the increase was unjustified, should company be asked to pay up the excess? Should the concept be applicable to formulations or should it include drugs? Should the exchange fluctuate be in-built into the system? All these questions require further study, Mr. Suri said.

Mr. Suri did not subscribe to IDMA's contention that the industry was spending two per cent of its turnover on research and development. He felt it was one per cent or 1.25 per cent at best. Now that the industry is claiming two per cent, it should at least strive to achieve that level, he said.

The target of 1000 crores worth of pharmaceutical export by the year 1994-95 was very conservative. The industry ought to aim higher, he observed.

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Leather effluent disposal units

A group of common effluent disposal units for leather tanneries in Tamil Nadu will be set up at an estimated cost of Rs. 3 crores to Rs. 4 crores each.

The State Government has agreed to give 25 per cent of the cost. A similar grant will come from the Union Government. Soft loans and funds from tanneries will take care of the balance 50 per cent.

The issue came up at the inaugural function of a training programme in tanning techniques and leather goods manufacture, jointly organised by the Common Wealth Fund for Technical Cooperation (CFTC) and Commonwealth Science Council (CSC), in collaboration with the Central Leather Research Institute (CLRI), Madras and Andhra Pradesh Tanneries.

Presiding over the function, Mr. M. N. Hashim, Chairman, Council of Leather Exports (CLE) felt that disposal of sludges is a major problem. Roughly four to five tonnes of sludges are released everyday. A task force had been appointed by the State Government to look into the matter. But it could not decide on a place for disposal.

He found fault with the leather industry for not exploiting in full the facilities available in the country. The thriving leather industry can create more jobs. It can employ a lot of women too.

One advantage of the Indian leather industry is its self-sufficiency in raw materials. In this case, it is better placed than South Korea, Taiwan and Hong Kong, other major leather exporters in Asia.

Inaugurating the function, Mr. P. M. Balliappa, Chairman, Tamil Nadu Pollution Control Board called for the application of modern technology for effluent control. He was happy that Indian industry is moving in that direction. Pollution of environment cannot be

solved by a time-bound programme, he pointed out.

Referring to Mr. Hashim's call for experts from abroad, he said the Board would discuss it.

The three-month training programme will benefit 15 participants from the Caribbean countries and Tanzania in leather tanning and finishing and small leather goods manufacture. Carcass byproducts utilisation and physical testing of leather goods will also be taught.

LEATHER FAIR FROM JAN. 31

The fifth India International Leather Fair, organised by the Trade Fair Authority of India, will begin at Madras on January 31.

The five-day fair will be inaugurated by the Commerce Minister, Mr. Arun-Nehru. He will also present the "best

exporter" awards instituted by the Council for Leather Exports. The fair, which has export promotion and technology upgradation as its twin objectives has been growing in size and content, and within a few years of inception, it has established itself as an important event in the world calendar of leather fairs.

An additional significance of this year's fair is that it will provide a window-view of the shape of the world industry in store in the nineties and what it holds for India in the changing scenario in relation to its plans and projections.

So much so, the fair has been much awaited not only by prospective participants but also by buyers and other businessmen as evidenced by the heavy response. According to TFAI, the scale of participation and the composition of product display in this year's fair will be much higher and more varied than in the previous years.

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BHOPAL GAS LEAK VICTIMS

Prime Minister assures interim relief

The Prime Minister, Mr. V. P. Singh, announced that interim-relief will be paid to the victims of the Bhopal gas tragedy in all the 36 affected wards in Bhopal. The Prime Minister said a high-level Central consultative committee with the finance minister as president, would decide within a month regarding payment of interim relief to the affected people.

The petroleum minister, the Union law minister, and the railway minister who would also be on the committee, would get in touch with voluntary organisations working for the relief of gas-victims and the Madhya Pradesh government, Mr. Singh said. Addressing a massive public meeting in Bhopal, the Prime Minister said the affected people needed quick relief and an interim relief would be paid first, overlooking medical reports. The Prime

Minister said the gas-affected people had not yet been provided adequate relief though it was one of the worst industrial disasters that took place in Bhopal in December 1984 in which thousands had been killed.

He, however, assured the people they would not have to wait for long as the present government would provide them immediate succour. Amidst cheers from the people and slogans of "Union Carbide murdabad", the Prime Minister declared that the present government "will not bargain with the lives of those killed in the worst gas disaster in Bhopal. The present government will also not reach any settlement with the guilty Union Carbide on the lives of those killed in the disaster." "Such events", he said, "are national issues and should be taken up forgetting political affiliations." The Prime Minister

who went to the gas-affected straight from the airport met the suffering gas-victims who handed over a number of memorandums seeking reliefs. Referring to exoneration of criminal liability of Union Carbide regarding the deaths of people in the settlement reached with the company, the earlier government, the Prime Minister asked how can a company get away after committing such a heinous crime.

"There would be no compromise with the crime in the settlement compensation with the company," he added. Earlier, the Madhya Pradesh chief minister, Mr. S. C. Shukla, who also spoke at the meeting, welcomed the Prime Minister, on behalf of the people of the state, and said the state government was doing its best for the gas-affected people.

He sought the Union Government assistance in providing more relief to the affected people. He said Rs. 120 crore were spent by the state government on the gas-hit people and it (State Government) would provide relief of Rs. 300 crore per month to those, 15 per cent of whose lungs had been affected by the gas. He said the Central assistance would help ameliorate the suffering of the affected.

PANEL ON RELIEF TO GAS VICTIMS

A four-member ministerial committee has been constituted to go into the quantum of interim relief to be paid to the 36 severely affected families in the Bhopal gas tragedy. Mr. Madhu Danavate, Mr. M. S. Gurupadaswamy, Mr. Dinesh Goswami and Mr. George Fernandes are the members of the committee.

The committee will also hold discussions with various social activist groups associated with payment of compensation to the victims of the Bhopal tragedy.

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PIPING GAS FROM GODAVARI-KRISHNA BASIN

Efforts to set up distribution facility being explored

Discussions are on between industrialists in Andhra Pradesh and the concerned Central government undertakings on the possibilities of setting up a distribution facility for piping gas from the Godavari-Krishna basin and some onshore fields, Mr. Ajit C. Kapadia, managing director, Hindustan Oil Exploration Co. Ltd., (HOEC), said at Bangalore on January 23.

He said that a gas distribution plan was something which had to be undertaken simultaneously with the discovery of gas. However, in India, there was very often a long time-lag in this regard. For instance, gas had been discovered in South Bassein sometime in 1978 but it was only now that serious attention was being paid to the distribution aspect. HOEC, which was the first private sector company to be set up to supplement the efforts of ONGC and OIL in oil and gas exploration, was, he said, fully aware of the need to ensure that efforts for the distribution of gas went on simultaneously with its discovery.

"It is in this context that HOEC has made 19 per cent investment in the equity of the Gujarat Gas Co. Ltd. which is being jointly promoted by Mafatlal Fine and the Gujarat Industrial

Investment Corporation (GIIC) to distribute natural gas in the state of Gujarat to industrial, commercial and domestic consumers", he said. Mr. Kapadia was in Bangalore in connection with HOEC's issue of one crore equity shares of Rs. 10 each for cash at par including an offer of 45 lakh shares of the Indian public to raise the equity base of the company which proposed to embark on three projects involving a capital outlay of Rs. 10 crores.

HOEC had signed a letter of intent with International Petroleum Ltd. (IPL) to take 10 per cent of the share in a Krishna-Godavari offshore block. The estimated cost for this project for drilling the first exploratory well was Rs. 4 crores. HOEC was also having ongoing negotiations with Oil India Ltd. (OIL) for joint exploration of areas in the Ganges basin.

The cost of integrating data and acquiring data in promising zones was estimated to work out to another Rs. 4 crores. The third project, involving setting up of infrastructural facilities like a computer centre for undertaking seismic data analysis, would cost about Rs. 2 crores. Mr. Kapadia noted that, while oil exploration was a high-risk

area, it was also a highly profitable. As per the company's letter of intent with IPL, HOEC was entitled to a share of the benefits from the Krishna-Godavari offshore block. If a well, HOEC's share of the benefits, estimated, could work out to 10 crores over a period of 15 years, it was the field life of the block.

ARIHANT FABRICS PLANNING EXPANSION

Arihant Fabrics Ltd. has chalked out a Rs. 63.5 crore expansion plan to be implemented over the next two years. According to Mr. K.L. Jain, Chairman and Managing Director of the company, a spinning project of 25,000 spindles would be set up with an investment of Rs. 30 crores for the manufacture of polyester and cotton and blended and combed cotton yarn at Dehlon in Punjab. Expansion of the company's worsted spinning unit at Sikandra UP from the existing 6,000 spindles to 12,000 spindles, a wool combing at Sikandrabad with a capacity of 7,14,000 kg of combed wool for intensive consumption, expansion of sulzer weaving plant from the existing 24 machines to 100 sulzer power looms, adding sophisticated machinery for the processing of its worsted suiting also included in the expansion scheme, he said.

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Call to boost dyes, chemicals exports

Mr. Ramu S. Deora, Chairman Chemexcil, suggested, that exporters of dyes and chemicals must endeavour to take up new export products and penetrate new markets to attain additional exports.

Inaugurating a workshop jointly organised by Gujarat Industrial and Technical Consultancy Organisation (GITCO) and Gujarat Dyes Manufacturers Association (GDMA), he said that there were a number of factors which clearly indicated the bright export prospects for dyes and chemicals.

He pointed out that supply gaps in the international market compared to the total demand for dyes and dye intermediates and chemicals originate in many western companies.

This is because of the growing anti-pollution legislation enforced on these

groups of items. The availability of a broad industrial base and technical capabilities in India, backed up by competent marketing force, and availability of spare capacities should be able to meet the growing export demand in the immediate future.

Although China has been generally thought to be a competitor for our products in the international market, there is considerable scope for exports of various items covered by the Council to China. Similarly, the importers of Europe seem to be quite receptive to Indian products, both in terms of quality and prices. Although they are, by and large, happy with delivery schedules, some improvements in this regard are called for.

However, in the context of ECM scheduled to become a single market by 1992, as also the trends of liberalised

economic environment in East the Indian industry will have to up to meet the growing challenge is necessary to retain itself in the pean market, and also to increase share of business.

Similarly, there is a greater scope for export of dyes and chemicals to USSR because of the acceptance of Indian products, in terms of quality and competitive strength. As such, it is believed that with a little more push and vigour, Indian industry can convert its capabilities into actual export business.

He pointed out that although there are enough capacities available within the Indian industry to meet the demand in the immediate future, constraints on the raw materials needs immediate and effective tackling.

A series of top level meetings have been scheduled on this vital issue by the Ministries of Commerce, Industry (Department of Chemicals and Petrochemicals) and other administrative ministries, public and private sector units, exporters etc., from time to time.

These efforts have culminated in a scheme for supply of key raw materials, coming into effect, under which PSUs have been asked to reserve 15 per cent of their annual production to meet the requirements of manufacturers engaged in export production.

KRIBCO DECLARES DIVIDEND

The Deputy Prime Minister, Mr. Devi Lal, was presented with a cheque of Rs. 19,68 crore by the K. Shikhar Bharti Cooperative Ltd. (Kribhco) towards the dividend for government of India's share capital.

The Kribhco chairman, Mr. Uday Bhan, and its managing director, Dr. K.K.S. Chauhan, presented the cheque.

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ER-CHIP TECH

Godrej and Boyce claims pioneer effort

The Electronic Business Equipment Division of the Godrej and Boyce business group has staked the claim to being the first in the world to come up with a computer work-station incorporating the super-chip Intel 860. Speaking to newsmen recently, Mr. Manu Parpia, Vice-President, Electronics Business Equipment Division, said that the work-station would also be the first to offer the complete range of software developed on the Intel 860 products. The project for manufacturing the work-station, he said, had been mooted initially in April 1989 and within a period of six months had come to the design stage and would be up for commercial sale by July this year, after being unveiled at the CeBit computer fair at Hanover, West Germany soon.

"We will be the first to show such a product anywhere internationally", he said. According to Mr. Parpia, the two products developed in the Symphony work-stations family right now are a single board computer and a dual processor, with two working prototypes and the first design already on hand. The designs he said had been tested repeatedly by an audit team at IIT, Powai headed by Prof. S. S. S. P. Rao, head of the computer science department and was in the last stages of layout.

The product, he said apart from other features which were to be revealed after commercial launch, was also amenable to the porting of Unix and X-window standard software and a prototype board was being taken to the US for the purposes. The entire range of Godrej software currently developed would be available on the product he said. Mr. Sidh Agrawal, Intel's representative in India said that with the successful incorporation of the super chip in the work-station it would now be possible to have the capability of a low cost supercomputing system on the desk. The machine, he said, according to

tests carried out, showed a power rating of 33 VAX million instructions per second (MIPS) at 40 megahertz making it one of the fastest of its kind in the world. Intel, he said, had designated Godrej as an authorised Beta site and handed over details of the microprocessor to the company by June 1989. Calling the occasion a historical event Mr. Agrawal said that with the new product Godrej would become a major force in the national workstation market. Godrej plans to market and licence the design on a worldwide basis, besides exporting the software developed for the product, which according to Mr. Parpia can be ported onto other work-stations also. The proposed price for the system at present, he said, was between Rs. 7 lakhs to Rs. 10 lakhs depending on the configuration. Future plans of the electronics division of the company, according to him, include the introduction of

an Intel 860 multiprocessor by November 1990.

ICI PLANT GOES ON STREAM

ICI India Ltd., has started working its new 20,000 tonnes per annum polyester fibre plant at Thane. The company plans to work at 50 per cent capacity in the coming months and export 5,000 tonnes in 1990. It proposes to sell the rest in the local market in addition to the old 10,000 tonnes per annum plant. The company utilises PTA from Reliance Industries Ltd., at the exorbitant price of Rs. 32 per kg against the landed cost of Rs. 34 per kg. inclusive of 190 per cent import duty. Against exports of PSF it will be getting PTA duty free under the advance licence scheme. The move of the company is surprising due to glut in the polyester fibre market. The move to re-open the plant perhaps indicates an effort being put by the UK parents to mend matters though none is prepared to buy the argument.

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Industrial alcohol

It is deplorable that State Governments are taking long to withdraw their levies on industrial alcohol. The full bench of the Supreme Court invalidated these levies nearly three months ago while disposing of the Synthetics and Chemicals case. Yet, barring Maharashtra, no other State has taken effective steps in pursuance of the Supreme Court judgement.

Even the Maharashtra Government has not honoured the true intent and spirit of the judgement in as much as it has withdrawn the "transport fee" but introduced the "administration fee". In all fairness to the Maharashtra Government it must, however be noted that the incidence of the administration fee is lower than that of the transport fee by about 30 paise per litre. Needless to add, alcohol-based industries strongly feel that the Government should have fixed the administration fee at a level significantly lower than the present rate of 20

paise per litre. Not surprisingly, user industries want the Union Government to look into the matter.

The immediate concern of user industries is however, the imbalance between demand and supply of industrial alcohol. In fact, user industries have urged the Government to ban exports of industrial alcohol. As is only to be expected distilleries oppose this demand. It needs to be emphasised that during the last season (November-October) the distillery industry was bedevilled by huge unsold stocks. Many distilleries encountered serious storage difficulties. Some of the them were constrained even to suspend production for a while. It was in these circumstances that the Government permitted exports of industrial alcohol and relieved the distillery industry of the burden of unsold stocks. This, coupled with the fact that the supply of industrial alcohol is expected to rise during the current year, seems to sug-

gest that the demand for exports of industrial alcohol is premature.

User industries ought to realise that sugar production is expected to rise from 87 lakh tonnes to 92 lakh tonnes during the current season. On the basis of crop reports from different countries, sugar industry expects that it should cause no surprise if production is around 96 lakh tonnes coupled with the fact that the current balance of payments position is not as good as it seems to suggest that the Government has no reason to ban exports of industrial alcohol in a hurry. Moreover, large-scale exports are not easy as last year's experience of export restrictions is anything to go by. From the view of user industries what is more important is a smooth supply of molasses and industrial alcohol to the country. Moreover, the Government must ensure that the problem of state movement of this essential material is not worsened by State

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MINERAL OILS IN FOODS BANNED

The government proposes to ban the use of mineral oil in any form in food articles except where such addition is specifically permitted in accordance with the standards laid down under the prevention of food adulteration. The prevention of food adulteration rules are to be amended accordingly, says an official release.

FIRE BREAKS OUT IN TAT MILLS PLANT

A fire broke out at 9.00 A.M. on January 22, in one of the plants of Tat Mills in Cochin, fire service reported.

The fire was still raging at 09.30. Fire service tenders had rushed to the scene and were engaged in putting out the flames.

all to production costs in coal mining

course to seven-day working and reduction of four overlapping shifts eight hours can result in dramatic improvement in production and productivity and reduce costs of production as investment costs in creation of additional production capacity in coal mining, according to Mr. K.S.R. Chari, Joint Secretary in the Department of Coal.

Mr. Chari was delivering the keynote address at the National seminar on future scenario of coal mining in India at Hyderabad recently. These measures could bring about a 50 per cent increase in coal production with minimum additional investments, he said.

Referring to the environmental problems, Mr. Chari advocated simple cost effective technologies that are more appropriate to the country than going in for expensive imported technologies. In mining, it is desirable to seek appropriate technologies. In order to meet the rising costs of transportation of inland waterways should be seriously explored, he observed.

Inaugurating the seminar, Mr. T.L. Venkatar, Chairman, APSEB, suggested countering the propaganda against coal and power generation by those advocating alternative sources.

Presiding over the seminar, Mr. V. V. Narasimha Murthy, Chairman and Managing Director of the Singareni Collieries Ltd., presented a 10-year perspective plan involving an outlay of Rs. 2000 crores for development of Singareni coal mines which have been prepared.

Contract system cut urged

Delay in implementation of many open cast projects can be traced to delay in construction of coal evacuation facilities like coal handling plants and railway siding.

The overall pace of implementation in the case of underground projects is

not satisfactory. The overall realisation of production from these projects is only 50 per cent and the main causes of delay are in establishment of mine entries like shafts and inclines, slow development of underground working and inadequate geological knowledge of the geomining conditions prevailing in a mine.

Pointing out the causes of delays in implementation in a paper entitled "Planting preparedness and project implementation" Mr. S. Radhakrishna, Advisor (Projects), at the national seminar on future of coal mining, Department of Coal and Mr. G. Sengupta, Deputy CE suggested the following measures:

Strengthening and streamlining "contract management services" in coal companies; Formation of a construction wing with or without foreign collaboration, to undertake shaft sinking, incline drivages and construction of other infrastructural activities.

Improving the present system of interpretation of underground geomining conditions by application of more geophysical inputs, and coal companies should monitor cost parameters in the same manner as they do time schedule for project construction. For this a suitable package for monitoring resource-based network through computers is to be adopted.

The authors pointed out that though Coal India Ltd. has formulated a contract management manual, the formation of an effective contract management service wing, at the company level is yet to take place. As a result, jobs like construction of coal handling plants and railway sidings are inordinately delayed in procedural wrangles. Though Railways do not take much time in construction of sidings, overall period of construction reckoned from the commencement of preliminary negotiations with the Railways is more than ten years in almost all cases. Many opencast pro-

jects would be completed in time if construction of CHP and railway sidings are expedited.

A departmental construction wing has also been suggested to be formed for fast driveage of shaft and inclines, with collaboration in the form of consultancy services obtained from the USSR, Poland and FRG. In a paper on "Future trends in coal mining technology", Dr. M.M. Seam, Additional Chief Mining Engineer, Mining Technology Division of CMPDI in Ranchi, stated mechanised underground mining took its start only in the late seventies and as such development of equipments required for this is still in its infancy.

Seeing the critical role that underground mining technology has to play in the coming decades, especially beyond 2000 AD, it is imperative that this sector be encouraged to fabricate and design these equipment, under licence or otherwise, to the maximum. Such equipment include items like side discharge loaders, load haul dumpers, longwall equipment like shearers, ploughs powered supports, armoured flexible conveyors, underground telecom and telemonitoring equipment, roof bolsters etc.

FOREIGN BANKS CUT RIL AGENTS BILL FACILITY

Discounting of bills facility provided to various agents of Reliance Industries Ltd. (RIL) by some of the foreign banks such as Duestche Bank, American Express Bank, and Bank of Commerce and Credit International Ltd., has been drastically reduced. These banks have been using their discretionary powers liberally with respect to the agents of RIL. They appear to have grown more cautious now. It is further learnt from informed sources that the delivery of polyester filament yarn and polyester fibre from RIL has slowed down. RIL had been enjoying a good reputation as a client under the Foreign Trade Development Finance Corporation (FTDF) scheme. Finance was no constraint to them.

EIGHTH PLAN

Rs. 2,000 crore for fertiliser industry

The Deputy Prime Minister, Mr. Devi Lal, announced that an investment of Rs. 2,000 crores would be made in the fertiliser industry during the Eighth Plan. Addressing a press conference at Surajkund near Delhi, Mr. Devi Lal, who is also the Agriculture Minister, said the investment to be made in public, private and cooperative sectors was intended to create an additional capacity of 3.2 million tonnes of nitrogen and 1.5 million tonnes of phosphates.

During the Eighth Plan (1990-95), the major plants which are expected to be set up and commissioned are nitrogenous plants at Kakinada, Babrala, Gadepan and Shahjahanpur in the private sector and expansion of the existing capacity of Aonla plant in the cooperative sector, he said. Besides, further new capacity would have to be created in the industry and for that public and

cooperative sectors would continue to play an important role, he said.

Mr. Devi Lal said full credit should go to the farmers for increasing food production even though the monsoon this year was less favourable than that of last year. He said the government also expected record production of sugarcane which would be around 210 million tonnes and cotton, about 102 lakh bales. About the National Front's promise of writing off debts of small and marginal farmers, agricultural labourers and artisans, he said the government would spell out the details in this regard in the Union budget for 1990-91.

USSR SHOWS INTEREST IN IMPORTING PSF

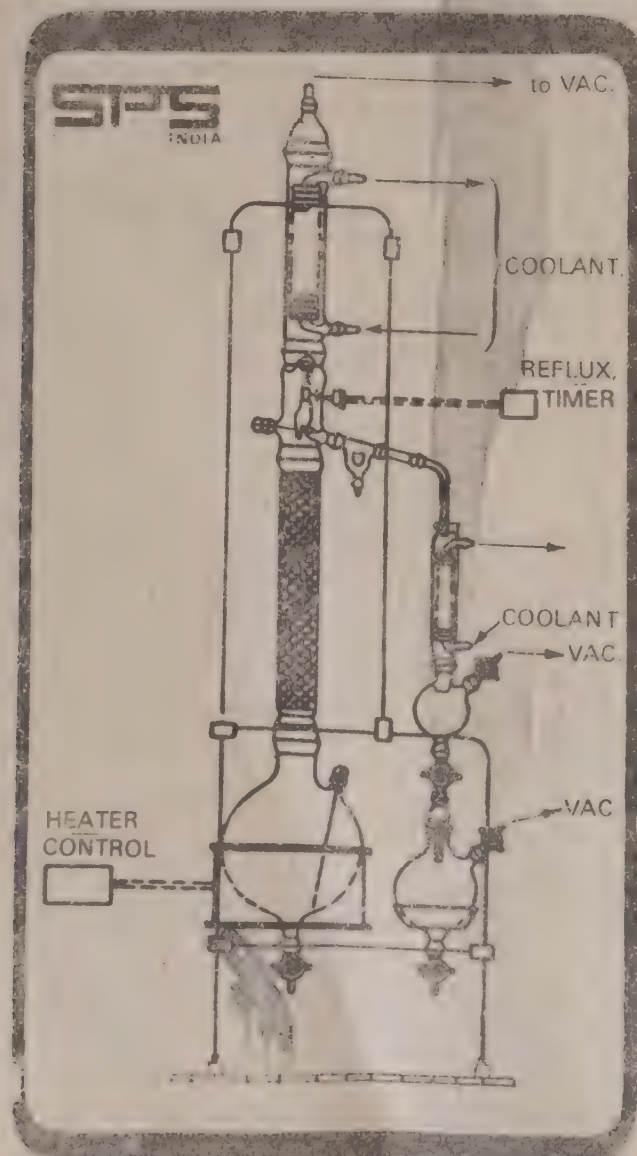
The Soviet Union has shown interest in importing polyester staple fibre (PSF) and polypropylene yarn from

India. The Soviet interest was confirmed during the discussions that took place during the delegation led by Mr. A.S. Choudhary, Deputy Minister, Ministry of Chemicals and Oil Processing Industry, with Mr. M.S. Gill, Secretary, Department of Chemicals and Petrochemicals.

The Soviet side also offered technology for disposal of toxic, solid and liquid effluents, and recycling of water from chemical plants.

A memorandum of understanding (MoU) was also signed at New Delhi recently between India and the Soviet Union to provide a framework for co-operation on a continuing basis in the field of chemicals.

The MoU provides for setting up a joint working group for this purpose. The working group will organise contacts and exchanges between experts from the two countries in the field of chemicals and allied products. It will also assist in transfer of technology and setting up of joint ventures.

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Energy enters new era

Power stations, whether coal, oil or nuclear powered, are part of the landscape in just about every country in the world. But many economies are going to see more of another type of power station — smaller, quicker and cheaper to build and principally powered by a mechanism closely related to the jet engine. Such stations, usually ranging from around 100 MW to 900 MW in capacity, can also have extra equipment fitted to provide district heating as well as electricity. These are known as combined cycle, cogeneration stations.

Combined-cycle plants, which produce electricity from both a gas turbine and a steam turbine, have been around for quite a long time. One estimate says that there are 35,000 MW to 40,000 MW of combined-cycle station capacity in the world, though most of this is from small industrial plants. Combined-cycle technology looks like coming into its own for two reasons. One is that gas has recently become an accepted form of fuel for power stations. The other is that the economics of electricity supply are changing, working in favour of combined-cycle's high thermal efficiency and moderate investment costs.

Efficiency is higher than in conventional stations. The output of electricity to the input of heat (fuel) is typically 50 per cent, much higher than a coal-fired station. Gas also provides lower emissions, allowing the station to generate almost no nitrogen oxides. The one big disadvantage is that you need a piped gas supply. Gas turbines will run on emissions from burning fuel such as coal but that would lower efficiency. Theoretically, diesel engines could be used instead of a gas turbine but there are a number of operational objections to that.

The gas turbine part of the station provides, rotative power direct through a generator to produce electricity. The exhaust temperature of the gas turbine (about 500°C) is used, at the same time, to heat water and generate steam to drive a steam turbine. This produces a

second source of electric power, again operating through a generator. In other words, a second source of electricity is obtained without burning additional fuel.

If the station also has cogeneration equipment, the main elements of which are condensers, it can also produce district heating. However, this reduces the amount of electricity produced by the steam turbine. The key technology in a combined-cycle station is the gas turbine. Such turbines range from a few megawatts up to more than 200 MW.

For power stations, industrial gas turbines rather than aero-engine-derived units are used. Jet engine derived units, in operation on all rigs, for example, require extensive maintenance every 500-1,000 hrs., a time period completely unacceptable to power station operators. One of the critical elements of design in a gas turbine, apart from the turbine blades, is the cooling system. The temperature of hot gases in the turbine can

be as high as 1,300°C. A typical 600 MW plant would use three 150 MW gas turbines, each about 26 metres long.

-- The Hindu

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Instruments demand in Eighth Plan may double

Demand for scientific and industrial equipment in the country is likely to register a phenomenal growth of about Rs. 1,000 crores per annum by the end of the Eighth Five Year Plan, according to Mr. Vinay Toshniwal, president of All-India Instruments Manufacturers and Dealers Association.

Of this, Mr. Toshniwal said, the demand for indigenously manufactured instruments could be about Rs. 700 crores — a two fold increase from the present demand level, and that for foreign instruments about Rs. 300 crores. The imported instruments would constitute mainly the sophisticated ones for use in high calibre R & D work, in health care etc.

Mr. Toshniwal has asked the government to change some of the existing policies for providing the necessary

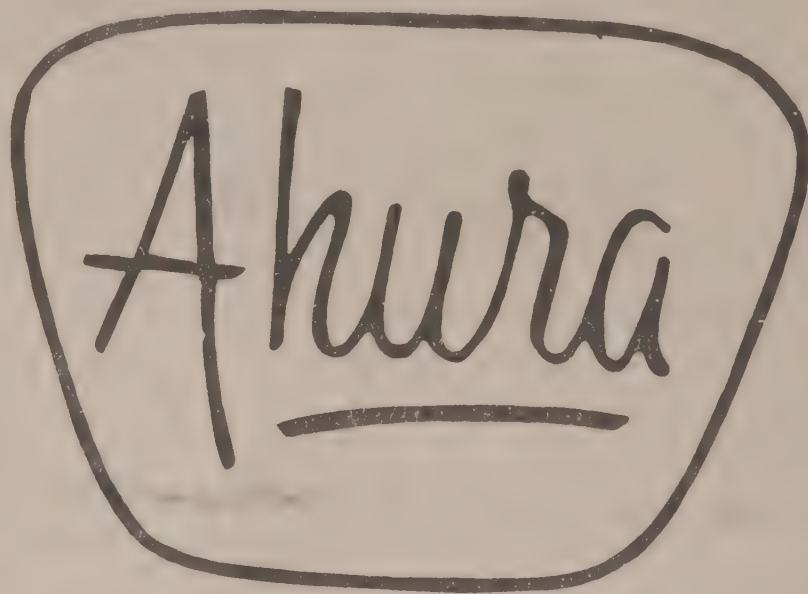
foreign exchange required to maintain the sophisticated imported instruments with minimum downtime. For instance, at times of emergency when foreign technicians come to India for repairing the faulty instruments, the existing import procedures do not permit them to bring spare parts. This in turn cripples the vital functions at the R & D centre.

Similarly, the government policy in respect of after-sales service needed immediate change, because the Indian agents' licence for importing spares does not entitle them to import PCBs without effective repairs and maintenance of an instrument was not possible, he said. He said that the small-scale sector has been traditionally producing the instruments and catering to both the domestic and foreign markets. But of late, large Indian business houses had entered the field. For instance, Tatas

have entered into a collaboration agreement with Honeywell USA and L with Gould for making instrumen

ANILINE PROJECT: PIL GRANTED LI

Polyolefin Industries Ltd. (PIL) received a letter of intent for the manufacture of 20,000 tonnes per annum aniline. The project is to be established in Bharuch district, a backward region in Gujarat, at approximate cost Rs. 46 crores. In view of the persistent shortage faced by the consuming industries, the Government has favourably considered the PIL's application for industrial licence for aniline. PIL is a major consumer of aniline for rubber chemicals and has technical and financial capabilities to manufacture and cater to the needs of consuming industries. PIL is in an advanced stage of discussions with various companies for technology tie-up and expects to finalise the same very soon.



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Railways to bring Cauvery crude to Madras

With an increase in crude oil production from the Cauvery onland basin, the Oil and Natural Gas Commission (ONGC) will soon be switching over the ferrying crude by rail tankers from Nagapattinam to Tondiarpet, according to Mr. V.C. Mohan, Director, Southern Region, ONGC. A pipeline is being laid to transport the crude from Tondiarpet to Madras Refineries Limited (MRL), Manali and it will be completed by the end of next month. It might be formally inaugurated on April 14. Crude from Thanjavur is now brought to MRL in road tankers.

The ONGC is now producing 700 tonnes of oil a day from Narimanam, Nannilam, Kovilkalappal and Adiyakkamangalam in Thanjavur district in the Cauvery onland basin, Mr. Mohan told a press conference at Madras recently. "This quantity is quite sufficient for rail transportation. So we are setting up a rail terminal at Nagapattinam", he said. The terminal is under testing now. The ONGC is now drilling one more well at Adiyakkamangalam, three at Narimanam and one at Vetikkadu. The one at Arumalai is under logging. Two wells are also being drilled in locations code-named PY-3 and PY-1 in the Cauvery offshore region.

Answering a question, Mr. Mohan said preliminary production of oil from the three wells already drilled in PY-3 structure will begin by April 1990-91. The PY-3 could produce 7,500 barrels of oil a day. Production of free gas from PY-1 will begin in about a year's time and after its integration with PY-3, the gas production from the two structures will be of the order of 0.5 million cubic metres a day. The development scheme for PY-1 and 3 include drilling of additional wells, platform for treating oil and gas, mooring and production facilities and pipelines to transport oil and gas. These will cost several hundred crores of rupees.

Under an agreement with the ONGC, the Soviets are now prospecting for hydrocarbons at Andimadam, Tirukkadaiyur and Bhuvanagiri in the Ariyalur-Pondicherry sub-basin.

The ONGC is also finalising its feasibility report on setting up production facilities in the Ravva offshore structure in the Krishna-Godavari basin. The structure will yield a few thousand barrels of oil a day. (Ravva in Telugu means diamond. The ONGC has named several of its offshore finds after precious stones viz. Heera, Panna, Neelam).

Royalty issue

Answering a question on the Tamil Nadu Government's demand for royalty for the oil produced from the Cauvery basin, the Regional Director said the ONGC has been paying royalty to the State Government ever since it started producing hydrocarbons in Tamil Nadu. The amount paid now is about Rs. 200 for a tonne of oil.

A fee is also paid to the State Government for exploring oil/gas onland. It is paid to the Union Government if the exploration is offshore. When oil is struck the ONGC enters into a mining lease with the State Government. The Centre decides the royalty amount and "if the State Government wants more, it has to talk to the Central Government," he said.

The production of oil from the Cauvery basin in 1989-90 was 0.2 million tonnes and the target for 1990-91 is 0.5 million tonnes. The production of crude from both the Krishna-Godavari and Cauvery basins by the end of the Eighth Plan would reach 3.5 million tonnes. The number of rigs looking for oil in both the onland and offshore regions of the Krishna-Godavari and Cauvery basins will double soon from the present 20 to 40. The southern region is poised for more than ten-fold increase in pro-

duction of oil and gas in the Eighth Plan, Mr. Mohan added.

ONGC 'SAVES' Rs. 850 CRORE IN FOREX

The Oil and Natural Gas Commission (ONGC) has claimed to have saved foreign exchange worth Rs. 850 crore in 1989 with more Indian companies providing equipment, material and services for its projects.

ONGC's annual expenditure on equipment, material and services in the year 1988-89 was about Rs. 1,800 crores. The saving of foreign exchange worth Rs. 850 crore with supplies from 100 public companies in 1989, was "significant". Six years ago, only 10 per cent of its procurements were obtained from Indian suppliers, an official spokesman said on January 17.

ONGC has simplified procedures to help Indian suppliers save foreign exchange and is trying to persuade the government to do the same. To help Indian industries in the public and private sectors, regional ONGC centres have been empowered to register firms.

Efforts were also being made to bring more items of recurring nature under the annual rate contract to provide assured business to the Indian companies.

Rate contracts are to be awarded to those companies with proven expertise and capacities to manufacture items and providing services to ONGC.

Meanwhile, the ONGC and the Confederation of Engineering Industries have decided to reconstitute the joint working group to bring more areas under its wing.

In the drilling, mud logging and planning spheres, joint working groups have been set up. ONGC has requested the CEI to provide more details of Indian industries so that direct orders can be placed with them, the sources said.

TNC's domination in biotechnology a source of concern

International experts have expressed concern at the concentration of biotechnology development in the hands of a few Transnational Corporations (TNCs). The position has been aggravated by the pressures exerted by the industrialised countries particularly the US on Third World countries to liberalise their patent laws so as to ensure monopoly control to the TNCs not just on plants but on plant traits.

The privatisation of knowledge and the domination of TNCs, they aver, have shifted research towards short-term profits and an emphasis on commercial applications at the expense of research addressed to Third World needs. There is also the risk that the privatisation of bio-technology will favour large production over small and cash crops over food. These are factors which could profoundly affect the livelihood of rural producers and the communities.

The industrialised countries, under the leadership of the US consider that lack of protection to TNCs as unfair trading practice. The US is particularly using trade as a weapon in the battle over patents. The US has set precedence in granting utility patents which allow claims for only part of the plant of genes expressing certain traits like black flowers, tolerance to salt water, the ability to produce nitrogen etc.

This gives the patent-holder the right to exclude or collect royalty from others reproducing any plant or selling seeds carrying the patented trait. A plant breeder wanting to utilise these genes in another variety or species would require a user licence. Utility patents also make the practice of planting second generation seeds from a protected variety illegal. The utility patents will double the current seed bills of farmers.

In the circumstances, the experts feel that the strategic responses to these developments should include the development of indigenous capacity through national bio-technology programmes,

education and training and the strengthening of information systems built around the International Centre for Genetic Engineering and Biotechnology and the International Agricultural Research centres. The other key response should be an international agreement governing equal access to plant genetic resources for all the countries. The United Nations centre on Transnational Corporation must play a role in strengthening the developing countries' negotiating capacity. The developing countries should be helped in building a technology base of their own, arrest their brain drain, network their research and learning centres.

BIOTECHNOLOGY ASSOCIATE SCHEME


Twenty five scientists have been selected for associateships under the bio-

technology overseas associate scheme for the year 1989-90. Long-term associateships are being awarded to Dr. R.K. Sharma, Dr. K. C. Bansal, Dr. Shekhar Majumdar, Dr. S. Tara Devi, Dr. J.M. Naidu, Dr. Bhaskar Sharma, Dr. Velichetty Hanumanta Rao, Dr. Wahjul Haq, Dr. T.M. Vatsala, Dr. Jamuna Rajagopalan, Dr. Arun Kumar Sharma, Dr. P.N. Gambhir, Dr. K.K. Narayanan and Dr. C. S. Patil. The following ten have been selected for short-term associateship: Dr. Salil Kumar Bose, Dr. Rajendra Prasad, Dr. D.N. Deobagkar, Dr. Tapan Chakrabarti, Dr. P.K. Rajekar, Dr. Kunthala Jayaraman, Dr. Rashid Ali, Dr. Satish Kumar Gupta, Dr. P. S. Rao, Dr. Vinod Bihari and Dr. G. Ramananda Rao. According to an official release under the biotechnology overseas associateship scheme, two categories of associateships, long-term and short-term are awarded every year. While the long-term awards are tenable for one to two years, the short-term awards are for three months only.



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Aluminium import duty hike on cards

Import duty on aluminium is likely to go up, according to Mr. Aditya Birla, Chairman, Hindalco Industries. Mr. Birla said that this is being done to protect aluminium manufacturers who are facing glut. The prices in international markets have fallen. As per the latest reports, aluminium was quoted on the London Metal Exchange (LME) at \$ 1,600 per tonne. The existing import duty is five per cent ad valorem plus Rs. 2,500.

Estimates show that aluminium production of 4,00,000 tonnes in 1988-89 exceeded the demand of 3,90,000 tonnes. The production is likely to reach 4,70,000 tonnes in 1989-90 and 5,80,000 tonnes in 1994-95. The demand in 1989-90 is estimated at 4,30,000 tonnes, 6,15,000 tonnes in 1994-95 and 8,50,000 tonnes in 1999-2000. Aluminium imports in 1988-89 are estimated at 10,000 tonnes, 35,000 tonnes in 1994-95 and 2,70,000

tonnes 1999-2000.

The installed capacity was 5,80,000 tonnes in 1988-89 and is likely to reach 6,10,000 tonnes in 1989-90. During the years 1994-95 and 1999-2000, the installed capacity is likely to remain at 6,10,000 tonnes. The pricing and distribution of aluminium has been decontrolled with effect from March 31, 1989.

It is felt that there is an immediate need to increase the production capacity, to reduce dependence on imports. Imports would cause a heavy drain on the already strained foreign exchange resources. Creation of additional production capacity will not only make India self-sufficient in meeting the growing demand, but also make it an exporter of aluminium.

The world output figures have shown a rise during the first five months of 1989. The latest available figures have

been widely predicted to show a continuing rise in production. The trend is considered to be in line with the forecast of surplus aluminium in 1989. According to an estimate, the supply during the year is expected up by 2.1 per cent to 14.45 million tonnes and consumption by only 1.1 per cent to 14.21 million tonnes.

Consumption increased from 15 million tonnes per annum in 1950 to 3,20 million tonnes at present, attaining a compound growth rate of more than eight per cent per annum.

The Government has estimated that during the current year, the total production by the primary metal producers would be around 4,00,000 tonnes against an estimated total demand of about 3,85,000 tonnes.

According to a forecast issued by the European Aluminium Association, demand for primary aluminium is likely to rise by more than one per cent in Western Europe from last year's 4 million tonnes.

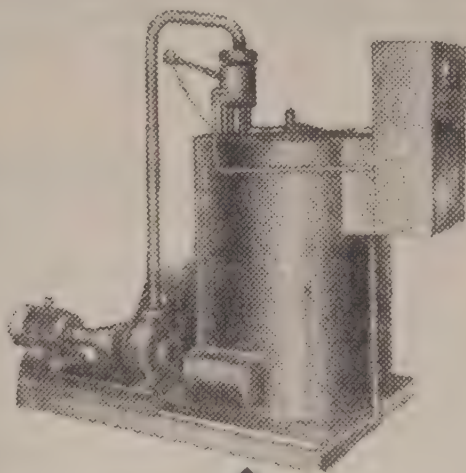
ORISSA POLY-SACK UNITS' PLEA FOR DUTY REDUCTION

The Orissa HDPE woven sacks manufacturers' Association has appealed to the Union finance ministry to reconsider the ministry's decision to raise the import duty on plastic raw materials. In a letter to the finance minister, Mr. H. D. Tendra K. Mohanty, the president of the association has said that Polyolefin Industries Ltd (PIL), the lone producer of HDPE granules (tape grade) in the country, had been supplying hardly about seven per cent of the total requirements in Orissa, balance being met through direct imports or on high seas basis.

HDPE granules had presently been costing around Rs. 36 to 39/kg. including a customs duty element of 114.5%. The latest increase would seriously impair working in the small scale sector.

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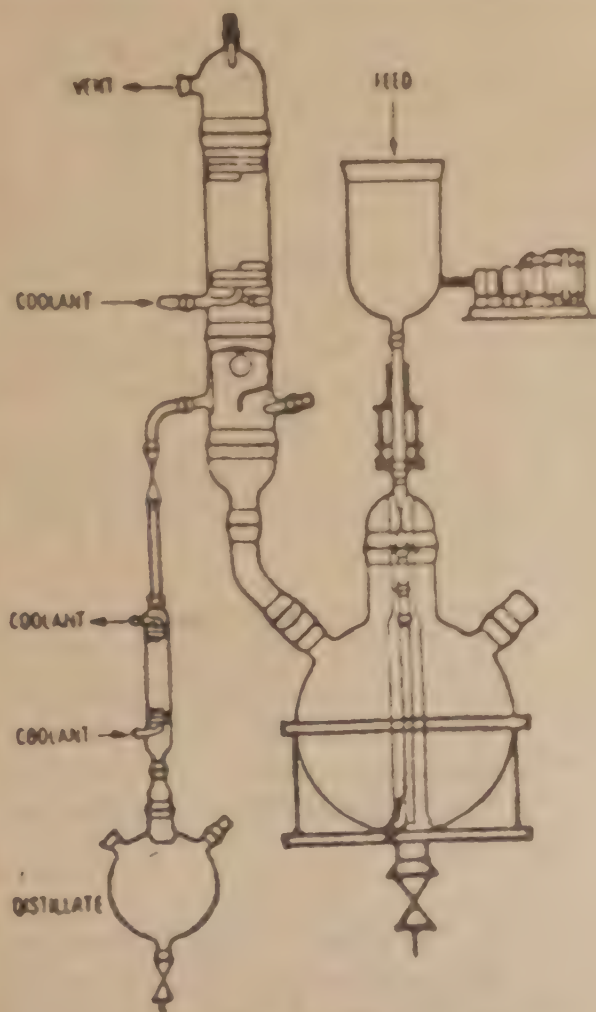
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AURIYA GAS CRACKER DOWNSTREAM UNITS

Product mix review sought

The Gas Authority of India Limited (GAIL) is seeking a review of the product mix for the downstream units based on the Auriya gas cracker.

The Auriya gas cracker, to be set up by GAIL, is to have an initial capacity to produce about three lakh tonnes per annum of ethylene. The Project Approval Board had allocated 50 per cent of ethylene to GAIL and 50 per cent to the C. K. Birla group for utilisation in downstream units.

GAIL was asked to set up one unit to produce low density polyethylene (LDPE) and another to produce polyvinyl chloride (PVC) at an estimated cost of about Rs. 600 crores. The LDPE unit was to have a capacity of about one lakh tonnes per annum and the PVC unit about 1.10 lakh tonnes per annum. GAIL's original proposal was for an

LLDPE unit instead of a PVC unit.

The C. K. Birla group was allowed to set up high density polyethylene (HDPE) and linear low density polyethylene (LLDPE) units at an estimated cost of about Rs. 300 crores with facilities for swinging capacity between LLDPE and HDPE.

GAIL has, however, found that the PVC unit would not be economical for it. First, the capital cost of the PVC unit would be very high because of the extra chlorine plant which will have to be put up. Secondly, large quantities of salt will have to be moved from Saurashtra to Auriya for this unit. The caustic soda to be produced in the unit will have to find a market in the Nalco plant in Orissa.

Thus, while there will be a market for PVC in the region, the economics of it

may work out to be better for a co-plant like that being set up at Hazira.

The proposal made by GAIL to the government now is to either increase capacity of the other three downstream units being set up at Auriya or to allow setting up of a polystyrene unit instead of the PVC unit to fully utilise ethylene from the gas cracker. Other products could also be considered.

Meanwhile, GAIL has already received three offers from foreign companies for the gas sweetening plant being set up by it as part of the gas cracker complex.

The recovery facilities for ethane and propane are proposed to be set up by EIL.

For the gas cracker also, GAIL has invited offers which are to be received shortly. The Auriya gas cracker complex is estimated to cost Rs. 1000 crores. A provision of about Rs. 100 crores has been made in next year's plan for the Auriya gas cracker out of the total outlay of Rs. 311 crores for GAIL approved by the Planning Commission.

Interestingly, while the Cabinet Committee on Economic Affairs (CCEA) had approved the grant of letter of intent to GAIL for the Auriya gas cracker, the downstream units based on this cracker are yet to receive the clearance of the CCEA.

PM TO OPEN SCIENCE MEET IN COCHIN

The Prime Minister, Mr. V.P. Singh will inaugurate the 77th session of the four-day Indian Science Congress at the Cochin University of Science and Technology campus at Cochin on February 4.

According to official indications, Mr. Singh will reach Cochin in the evening of February 3, on a two-day visit to Kerala.

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MANGALORE, KARNAL REFINERIES

Planners studying forex angle

The Planning Commission has commenced a detailed study of the economy of the Mangalore and Karnal refineries promoted in the joint sector.

It is not as if the Commission is against the two projects per se. Rather, they are debating on going slow till the foreign exchange and local resources crunch become more manageable.

With domestic crude production expected to remain stagnant, the two refineries will need a continuous allotment of free foreign exchange for import of crude. But if the refineries are commissioned, India's outgo on petroleum products could come down and there is general agreement that it is preferable to import crude than petroleum products. But, for the Commission, it is the immediate present which is important. They prefer to levy imposts to cut out of petroleum products and slow down work on the two refineries to get over the foreign exchange requirements to fund the twin projects.

Both the projects involve heavy forex expenditure. The integrated three-million-tonne per annum refinery linked to a 2.5 lakh-tonnes ethylene cracker should now cost around Rs. 1,450 crores with a foreign exchange component of Rs. 400 crores.

The Karnal Refinery, being funded by the Soviets will need less dollars to start off.

Hints have been made by the Government to officials of the Mangalore Refinery to raise foreign exchange independently through exports. But the understanding behind inviting private parties is to raise foreign loans without any Government guarantee. The last condition could pose immense problems to the promoters of the projects. Over the last few days, the issues are being discussed at the level of the Petroleum

Ministry and a clear indication could well be available in a month's time. But all this has not dampened the enthusiasm of the two promoters.

The Mangalore Refinery promoted jointly by Mr. Aditya Birla of the Indian Rayon Corporation and Hindustan Petroleum have estimated the cost around Rs. 1,400 crores inclusive of duty. But the Planning Commission is not very keen on naphtha crackers and would like to push the refinery capacity to six million tonnes per annum. The cost for a six million tonne per annum unit is put at around Rs. 1,100 crores with an foreign exchange outgo of Rs. 400 crores.

Mr. Birla is trying his best to get the cracker and the political equations favour him. And Mr. Birla is clever in asking for a cracker as refinery prices

are controlled by the Government. A fixed rate of 12 per cent post-tax return on equity after providing for interest and depreciation is allowed by the Government. This works out to 24 per cent per annum on a pre-tax basis at 90 per cent capacity utilisation. As products from a cracker are free of price interventions, the entire idea makes economic sense. The detailed project report of the Mangalore Refinery made by Lummus Crest of the U.S. has already got the pre-PIB (Public Investment Board) clearance. PIB will, however, await the review before finalising the deal.

In contrast, the Karnal Refinery, promoted jointly by Mr. Darbari Seth of Tata Chemicals and Mr. S.P. Khosla, Indian Oil Corporation, has drawn a lot of attention. The Centre is trying to sort out the differences between Mr. Seth and Mr. Khosla to speed up the process of setting up the project. Talks have been held but some critical issues have to be clinched. IOC is keen on the

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knowhow of UOP of the US for setting up hydrocracking facilities while Tata Chemicals favour Chevron, again of the US.

Incidentally, for the Mangalore Refinery, Lummus Crest has identified Chevron for hydrocracking facilities which is a must to raise the yield of middle distillates. Indian Oil's preference is understandable as the UOP knowhow has been used for the Koyali Refinery.

But the more crucial issue is participation by the Russians who have agreed to offer a Rs. 600-crore line of credit at 2.5% interest with payments over 19 years. The Union Government is insisting on utilising the Soviet credit and the joint sector partners are agreeable.

But laced to the Soviet offer are two options. Under the first, the Soviets will offer technical assistance and buy US technologies for the project with a promise to arrange dollar credit. The second is a turnkey offer with the Russians setting up the project.

A turnkey offer places the cost of the Karnal Refinery at a massive Rs. 2,600 crores which will make the oil products extremely costly. Both Tatas and IOC are against the turnkey at this price and talks have started with the Russians to bring down the prices.

Reports are that the Russians are prepared to restudy costs as the Tatas feel the cost of the refinery should not be more than Rs. 1,600 crores with an oil pipeline costing another Rs. 200 crores.

IOC has had a bitter experience with the Russians on setting up the Mathura Refinery. In the latter case, Russian equipment did not match Indian supplies with none having any control. Both Tata Chemicals and Indian Oil Corporation insist on penalties if the Russians take up the project on a turnkey basis and lift costs or delay imple-

mentation.

The Soviets seem to be agreeable though the Government has yet to sort out a major issue — import duty of 85 per cent on imported equipment. DGTD has said that supplies from Russia do not need indigenous clearance but the Finance Ministry is reluctant to cut import duty till project details are finalised. The Birlas and Tatas are keen on a 15 per cent import duty as it could cut costs.

All this means that till the Russian option is decided upon, PIB will not have a firm proposal from the Tatas. Tatas and IOC are prepared for the first Soviet offer of technical assistance and purchase of western technologies if the turnkey does not bring down costs.

It is a sad state of affairs that a country which requires petroleum products needs more than four years to formulate and finalise a plan of action to start work on just two refineries.

OIL IMPORTS TO COST Rs. 1,700 CRORES MORE

India's oil import bill is expected to rise sharply by over Rs. 1,700 crores in 1990-91 as domestic production and availability of crude and petroleum products will fall far short of demand.

As the demand for petroleum products is estimated to be 58.9 million tonnes (a growth rate of 9.3 per cent over the previous year) and indigenous crude availability for 1990-91 will be only 32.9 million tonnes, at least about 19.5 million tonnes would have to be imported, oil industry sources said.

Product import for the next year is to be 12 million tonnes, representing a total import of 31.5 million tonnes, valued at Rs. 8,230 crores.

With an expected export of 1.8 million tonnes of naphtha, fuel-oil and NGL valued at Rs. 480 crores, the net

import bill next year would be Rs. 7,750 crores, a steep increase over the current year, sources said.

In the current year, 1989-90, imports of crude and petroleum products touch 24.6 million tonnes at a cost of over Rs. 5,980 crores.

With demand projected at 77.7 million tonnes in 1994-95, almost the end of the Eighth Plan period, and over 100 million tonnes by the turn of the century or end of the Ninth Plan, it would necessitate importing around 36.3 million tonnes of crude and products in 1990-91 and 57.8 million tonnes by 1999-2000.

This is based on the assumption that all the three refineries at Karnal, Mangalore and Assam are commissioning and marginal capacity expansion planned at existing refineries.

Import bills are bound to increase over the decade at an alarming rate even assuming higher yields of crude oil from indigenous sources. But it is still difficult to project the exact quantum of import bill during the decade as it would depend on the fluctuating crude oil prices in the world markets.

Oil industry sources said the public sector Indian Oil Corporation, the sole canalising agency, would need to exercise greater judgement and exercise restraint while procuring crude products from the highly volatile oil markets around the world.

The sources also say that the present infrastructure cannot handle the large volume of imports of crude and petroleum products that are estimated to be imported during the decade.

With the availability of distillate products like kerosene, diesel and gasoil in international markets likely to become scarce, there is an impending need to increase the present refining capacity in the country of 51.85 million tonnes, the sources said.

Centre's response positive to Southern gas grid

For the first time, the Central government has responded positively to the standing demand for a southern gas grid. The Union Minister for Petroleum and Chemicals, Mr. M.S. Gurupadaswamy, told newsmen that he would be taking up the idea and that he hoped to get the assistance of other Central Ministries like Finance.

The minister stated that he had been assured by all the southern chief ministers to bring gas to the region which was short of electricity. The chief ministers of Kerala and Tamil Nadu had written letters to him, urging the setting up of a southern gas grid while the chief minister of Karnataka had also expressed interest in the idea.

Mr. Gurupadaswamy pointed out that almost Rs. 750 crores worth of gas was being flared and wasted in Bombay High every year and that the wastage of gas in the Assam, Tripura, Cauvery and Godavari basins had not yet been estimated.

While no survey had been done as yet, it could, he said, cost around Rs. 1,400 crores at current prices to pipe the surplus gas from Bombay High to Kanya Kumari.

This gas, he noted, could be used for generating electricity, for setting up fertiliser plants and also for converting iron ore into sponge iron. Another point of view was that gas from the Cauvery and Godavari basins could be used instead.

The minister noted that a southern gas grid could be the precursor of a national gas grid after 25 years. "We are also doing some loud thinking in the ministry on the possibility of entering into an agreement with the government of Bangladesh for running a pipeline through that country for piping gas from the north-eastern states like Assam and Tripura.

Bangladesh could also share the gas. Needless to say, all this is still in a very nebulous stage", he said. The ministry, he added, was also considering the recent Iranian proposal for piping gas from Bandar Abbas to Calcutta. "But our first priority will obviously be to try and see how we can minimise the wastage of gas in Bombay High", he said.

Mr. Gurupadaswamy also stated that he was toying with the idea of introducing a "completely comprehensive system", first in Delhi and then in Bombay, whereby gas could be piped to every home to take care of the energy and fuel needs.

Officials in the ministry, he said, were engaged in an exercise of working out the costs of such a project (involving the participation of the Gas Authority of India Ltd.) and which would have to be approved by the Planning Commission and the Union Cabinet. Such a project would, he said, also reduce the pressure on LPG cylinders which were currently being imported through the already saturated ports of Bombay and Vizag. The government was now thinking of importing LPG cylinders through other ports also, he said.

MPL TO COMMENCE PRODUCTION IN APRIL

With 90 per cent of civil and other engineering work in the prestigious Rs. 100-crore Manali Petrochemical Ltd. (MPL) project being over it is all set to go on trial production in April 1990.

Announcing this at a press conference at Madras, Mr. A.C. Muthiah, chairman, and Mr. G. Raghavendran, managing director, stated that the required machinery from abroad has landed and work is in full swing.

This 100 per cent import substitute

project will save nearly Rs. 34 crores of foreign exchange for the country. The project is coming up at Manali near Madras for manufacturing propylene oxide, propylene glycol and polyols with a capacity of 12,000 TPA and 6,000 TPA respectively. At present, all these items are imported, costing the nation around Rs. 60 crores annually, it was stated at the press meet.

To part-finance the project, being set up in collaboration with France and USA, the MPL is coming out with an issue of 160 lakh equity shares of Rs. 10 each on January 29 for the Indian public. MPL has been promoted by the SPIC with equity participation worth Rs. 11.40 crores.

Mr. Muthiah stated that the product will have a good demand in the country. The two main raw materials — propylene and chlorine — will be supplied by the MRL as well as SPIC, which will supply gaseous chlorine after purification stage.

GUJARAT CRUDE PRODUCTION HITS ALL-TIME HIGH

Crude oil production from Gujarat, one of the country's major contributors of oil, rose to an all-time high of 6.74 million metric tonnes (MMT), in 1989, following the adoption of new drilling techniques and accelerated efforts.

An Oil and Natural Gas Commission (ONGC) spokesman, said recently that about 4.1 MMT of this came from North Gujarat fields while the rest from South Gujarat. Similarly, total gas supply during 1989 was about 922 million cubic metres as against 825 achieved in 1988.

Of this, South Gujarat contributed 554 million cubic metres while North Gujarat gas fields supplied 367 million cubic metres, the spokesman said. Major discoveries in the region during the Seventh Plan include Nanda, Bechraji and Gandhar.

ONGC strategy to raise recovery from NE region

The Oil and Natural Gas Commission (ONGC) has drawn up a strategy to enhance oil recovery to 40 per cent from the fields in Assam and Nagaland. A study has revealed that it was possible to achieve this from both the developed and developing fields through application of water injection infill drilling and enhanced oil recovery (EOR) techniques, on ONGC spokesman said.

The total inplace geological reserves in Assam and Nagaland are estimated to be 438 million tonnes. Of this, the study has focussed on enhancing recovery from a balance of about 284 million tonnes of reserves. The recoverable reserves from fields like Lakwa, Geleki, Rudrasagar, Lakhmani, Borholla-Chanpang and Demulgaon total 111 million tonnes.

The ultimate recoverable reserves could be even higher when the recently discovered structures like Sonari, Khoraghat, Chamgmaigaon and Namti are included, the spokesman said. According to the spokesman, the major contribution to the reserves was likely to come from water injection and pressure maintenance, identification and production of undrained oil and application of EOR methods.

Pressure maintenance is being planned right from the start in new fields like Demulgaon, Sonari, Khoraghat and Uriamghat, he said. Infill drilling has already been initiated in the Lakwa and Rudrasagar fields to accelerate production and increase recovery.

Additional reperforation of wells had also resulted in increasing production by 560 tonnes per day. Two EOR schemes are also ready for implementation in the region: the LPG miscible gas process in Geleki field and water alternate gas process in Rudrasagar.

The incremental recovery in the case

of the LPG miscible scheme is expected to be 17% and the additional recovery in Rudrasagar around 10%. According to the spokesman, activities in the north-eastern region had registered a three-fold increase since 1980-81. Oil production from the region is planned to be stepped up from 3.1 million tonnes by the end of 1989-90 to 5.11 million tonnes by 1994-95. Gas production from the area is expected to go up from two million cubic metres per day at present to nine million cubic metres by the end of the Eighth Plan period.

The number of wells drilled would increase from 102 in 1990-91 to 153 by 1994-95 and the number of rigs in operation is proposed to be raised from the present 25 to 65. So far, more than 130 structures have been identified by ONGC in the region, of which about 50 have been explored by drilling. The Khoraghat-Uriamghat area has been identified as one of the thrust areas in Assam. ONGC has established a separate project called the Dhansiri Valley project to intensify exploration in this area as also in the adjoining parts of the Assam-Arakan fold belt in Nagaland.

HOEC MAY BAG KUTCH BASIN OIL HUNT CONTRACT

The Hindustan Oil Exploration Company Limited (HOEC), the first and the only Indian venture for oil exploration in the private sector, may be awarded the contract for exploring the Kutch basin for oil. According to Mr. Aji Kapadia, managing director, HOEC and former chairman of GAIL, the company has applied to the Gujarat Government for petroleum exploration licence for the Kutch basin and was confident of bagging it. However, he told newsmen that since a licence for oil exploration in the private sector may be difficult under the existing regulations, the company may be asked to go ahead on contract basis. He said HOEC has signed a letter of

intent with International Petroleum Limited (IPL), which is exploring Krishna-Godavari offshore block. Kapadia said the company proposed to enter into a memorandum of understanding with Oil India Limited, which the two companies would explore areas that may be granted to Oil India Ltd. by the government, subject to areas of exploration being mutually acceptable. The exploration of Kutch basin may be taken up immediately.

Exploration apart, the company has made 19 per cent investment in equity of Gujarat Gas Company Limited, jointly promoted by Mafatlal and GHC for distributing natural gas from the Gujarat state to industrial, commercial and domestic consumers. The company is entering the capital market next month to raise Rs. 10 crores for financing its exploration projects.

EXERCISE ON TO RATIONALISE DRUG INDUSTRY'S GROWTH

Measures for rationalisation, quality control and the growth of the pharmaceuticals industry will be reviewed with the objective of ensuring adequate supplies of essential drugs to the common man at reasonable prices, the Union Minister for Petroleum and Chemicals, Mr. M.S. Gurupadaswamy, told newsmen recently at Bangalore.

"We want", he said, "to ensure that the production of drugs is increased so that self-sufficiency is achieved. We also want to ensure that the industry pays remunerative prices so that further investment is possible. I have instructed my officials to streamline licences and procedures in the matter of issuing licences for new plants and machinery," he added. The minister also expressed concern about the bottlenecks in procedures for importing essential medicines like life-saving drugs. "Such drugs which are not being made here but which are urgently required, should be made available to people without delay," he said.

Bid to pave the way for Kandla-Bhatinda pipeline

The government has initiated a fresh move to resolve the tangle over the Kandla-Bhatinda petroleum products pipeline project. The finance ministry has again convened a meeting of various ministries concerned with the project following the initiative taken by the new petroleum minister, Mr. M.S. Guadraswamy.

The project had got bogged down in political controversies in the previous government though it was found to be sound on economic considerations. The railways and the previous planning minister had opposed the project on the grounds that it would deprive the railways of their revenue. The Planning Commission, which had at one time supported the project, rejected it later.

The commission was, however, asked by the then Prime Minister's office to review the decision. This happened just before the last elections to the Lok Sabha. However, sensing that it could prove to be a source of embarrassment for the ruling party in Gujarat, the Prime Minister's office hastily withdrew the directive to review the decision. It was, therefore, left to the new government to take a decision in the matter. However, according to petroleum ministry sources, no decision may be taken on the project before the end of next month.

The cost of the project, excluding marketing and terminal facilities, is estimated at Rs. 658.97 crores. The project which is proposed to be financed partly out of the World Bank loan, will take 33 months to complete. The project is awaiting clearance of the cabinet committee on economic affairs (CCEA). The pipeline is intended to transport six million tonnes per annum of petroleum products to the north-west region. The petroleum ministry has contested the railways' stand that the pipeline would lead to loss of revenue for them. According to the ministry, the

deficit of petroleum products in the north-west region is much higher than what can be transported by the railways, and that pipelines are the cheapest and the most assured mode of transporting petroleum products.

The Kandla-Bhatinda pipeline project was cleared by the Public Investment Board (PIB) in January 1989. It was found that the transport of products by pipeline would be about 2.5 times cheaper than by the railways. A fresh appraisal was then made by the PIB on the basis of the data supplied by the railways, but the cost of transport by the rail route still worked out to be quite high. Moreover, some of the data furnished by the railways and basis of their calculation were not acceptable to the appraisal agencies.

It was argued that the cost of conversion of 700 km of rail track from metre gauge to broad gauge would be Rs. 450 crores, while another Rs. 400 crores would be required for the rolling stock. This would be much more than the total investment on pipeline which was then estimated at Rs. 680 crores. The pipeline would also save about Rs. 70 crore per annum in operating costs.

ANOTHER REFINERY LIKELY IN TAMIL NADU

The long-drawn dream of Tamil Nadu to have another "refinery" is nearing fulfilment. According to informed sources, the Centre has cleared almost all the crucial formalities for setting up what is here "a mini-refinery" in the state to make use of the Narimanam outflow. The project report is now before the PIB for final vetting. After that, it will go to the cabinet sub-committee for approval.

Ever since oil and gas was found at Narimanam four years ago, there has

been a growing demand from all quarters for a distillation unit — some call it a mini refinery — within that area to avoid transportation cost and help the industrial growth of the area through the availability of associated gas there. The Tamil Nadu government had also been pressing the Centre to set up such a unit there and offered all infrastructural facilities. The proposed mini-refinery, when set up, will have the capacity of 0.5 million tonnes a year and the estimated cost is around Rs. 131 crores. The original cost was only Rs. 100 crores. The increased outlay is due to the fact that the refinery will have a gas-separation plant also. Like Ankleshwar crude from Narimanam is "sweet" and of a fine variety. At present, crude from Narimanam is transported to Madras Refinery Limited at Madras for refining and other purposes.

Once the PIB clears the project, it will take another 30 months for completing construction and other civil works, said the sources. The potential for kicking up the growth of the area is estimated to be high and the Cauvery Basin stand to gain a lot from this project. At present nearly 500 tonnes of crude is transported every day from Narimanam to Madras for refining and further use.

TAMIL NADU TO GET ROYALTY FOR LIGNITE

The Union Government has agreed to pay Tamil Nadu a royalty of Rs. 2.50 per tonne for lignite mined by the Neyveli Lignite Corporation. This was disclosed by Chief Minister Mr. Karunanidhi while replying to Mr. K. Ramani during question hour in the state assembly.

Mr. Karunanidhi said the government had pressed the Union Government for payment dues of royalty of Rs. 46.41 crores, which included interest on the dues. He said the government would also press for royalty for the oil in the Narimanam area.

PLASTICS

Duty hike badly timed

Plastics are to cost more. Producers who make polymers as well as processors who convert them into colourful articles like trays, buckets, bags, pens, slippers and toys alike agree that prices will go up. Both also agree that polymer prices are perhaps the highest in India.

A perusal of the Indian and global polymer prices in recent years seems to bear out the wide disparity between Indian and international prices. The following were the global prices of major commodity plastics in March 1987. The prices charged by local producers during the time is given in brackets. LDPE \$600 (Rs. 21,300), HDPE \$760 (Rs. 21,000), PP \$700 (Rs. 20,200), and PVC \$560 (Rs. 18,000). Compare this with prices prevailing during December 1989. LDPE \$880 (Rs. 30,500), HDPE \$900 (Rs. 30,790), PP \$850 (Rs. 31,000) and PVC \$680 (Rs. 25,000).

In other words, against an 18 per cent increase in global HDPE price, the only Indian producer increased the price by 46.6 per cent, against a 21.4 per cent increase in global PP price, the sole Indian producer increased his price by 48.5 per cent, against a 21.4 per cent increase in global PP price, the sole Indian producer increased his price by 48.5 per cent, and against a 21.4 per cent increase in PVC price, the local producers have raised their prices by 38.8 per cent. The increase in LDPE has been the same in India and abroad.

In the polemics between producers and processors, the advantages that wider use of plastics can bring about to the society get sidelined. The general public, Government and even the rest of the industry think only of the industrial and consumer applications of plastics. The vast potential of plastics in agriculture remains untapped. Use of plastic mulch films and irrigation processes can reduce the frequency of irrigation by 50

per cent, help irrigate additional land, increase crop yield by 20 to 80 per cent, depending on the type of crop and optimise the use of fertilisers. The duty hike has come at the wrong time. One polymer producer admitted: "When we were crying hoarse about crashing global prices, Govt. did nothing. The duty hike has now come when the prices are moving up." If only the Govt. had accepted the D.V. Kapur Committee's recommendation for a floating rate of import duty, the industry's trauma could have been avoided.

Grant of permission for setting up several new crackers had stirred up great interest in polymers in recent months. Financial institutions also reversed their earlier decision not to assist processing units. Processors and producers offices are alike plastered with "Plastindia" stickers, denoting the interest in new technologies and applications to be exhibited in the forthcoming Delhi fair. If new crackers are commissioned in the nineties and consumption polymers do not grow faster, the armchair critics who prophesy a PSF-like situation in polymers may well prove themselves correct, industry observers feel. (See p. 75 for table).

ENQUIRY INTO ION EXCHANGE CANCER DEATHS

The Inspector of Factories, Kalyan, Mr. S.D. Jagtap, is holding an enquiry into the cancer deaths at the Ambernath plant of Ion Exchange (India) Ltd. The results are expected to be known shortly. Nine workers at Ambernath have died since November '85, allegedly from cancer caused by the plant's operations. According to workers it is the poisoned atmosphere around the plant which is also causing severe chest problems. Even travelling on suburban trains has become a nightmare for them. The death of a worker Mr. B.N. Shetty on January 5 has been the proverbial last

straw, according to the workers. workers have been on strike since

The union leaders, Mr. Dina B. Patil and Mr. Parashuram Koparkar the management representatives on January 18 and have demanded adequate compensation from them. The Minister for Civil Supplies Mr. Nakul Patil also expressed his views against the plant. The workers had sent a strike notice on January 12 which according to Mr. Leslie D'Souza is to legalise the strike, and also a camouflage demanding higher voluntary retirement benefits. The management claims its record on workers health care is impeccable.

According to Mr. L.V. Keshavan, Works Manager "Our medical records are open for all to see and our safety standards is one of the best in the country". The company claims that only five have died of cancer, that too of lung cancer, caused by factors other than the company's activities. The highly polluted atmosphere of Ambernath is not the company's making alone. The death of Mr. Shetty is due to asthma which he has been suffering from for over eight years, according to the company.

The company supports its stand saying that there are 45 employees who have put in more than 20 years of service, yet they are perfectly hale and healthy. It also claims that it maintains a dossier on health of individual employees and its safety standards are what is prescribed in safety manuals. The strike has crossed its 15th day and according to the company the losses incurred have been to the tune of Rs. 30 lakhs.

MEET ON PARAXYLENE DUTY DENIED

The Finance Ministry termed a "incorrect and baseless" the report that the Finance Secretary, Mr. Bima Jalan, has called a special meeting for reduction in the import duty on paraxylene.

Polymer	CIF price US \$/MT	Duty structure previous/ revised	Preferred/ Non-preferred source	Basic duty	Aux. duty	CVD	Total	Exchange rate 1US\$=Rs.	Exchange price INR/mt	Landed price at Port Rs./mt	% increase
- PP	850	Previous	Non preferred	20%	30%	30%	95%	17.09	14527	28893	22.4
		Revised	Non preferred	Rs. 7000	45%	30%	88.5%+Rs. 9100	17.09	14527	37213	
		Previous	Preferred	10%	30%	30%	82%	17.09	14527	26968	
		Revised	Preferred	Rs. 3500	45%	30%	88.5%+Rs. 4550	17.09	14527	32572	
- HDPE	1000	Previous	Non preferred	20%	45%	30%	114.5%	17.09	17090	37391	10.6
		Revised	Non preferred	Rs. 6400	45%	30%	88.5%+Rs. 8320	17.09	17090	41345	
		Previous	Preferred	10%	45%	30%	101.5%	17.09	17090	35125	
		Revised	Preferred	Rs. 3200	45%	30%	88.5%+Rs. 4160	17.09	17090	37102	
- PVC	650	Previous	Non preferred	Rs. 1000	Rs. 3000	40%	40%+Rs. 5600	17.09	11109	21576	19.9
		Revised	Non preferred	Rs. 2000	Rs. 5000	40%	40%+Rs. 9800	17.09	11109	25860	
		Previous	Preferred	Rs. 500	Rs. 3000	40%	40%+Rs. 4900	17.09	11109	20862	
		Revised	Preferred	Rs. 1000	Rs. 5000	40%	40%+Rs. 8400	17.09	11109	24432	
LDPE/ LLDPE	850	Previous	Non preferred	Rs. 2000	45%	30%	88.5%+Rs. 2600	17.09	14527	30583	18.2
		Revised	Non preferred	Rs. 6200	45%	30%	88.5%+Rs. 8060	17.09	14527	36152	
		Previous	Preferred	Rs. 1000	45%	30%	88.5%+Rs. 1300	17.09	14527	29257	
		Revised	Preferred	Rs. 3100	45%	30%	88.5%+Rs. 4030	17.09	14527	32042	
PS	950	Previous	Non preferred	30%	30%	20%	92%	17.09	16236	31797	58.0
		Revised	Non preferred	Rs. 17500	45%	20%	74%+Rs. 21000	17.09	16236	50236	
		Previous	Preferred	15%	30%	20%	74%	17.09	16236	28816	
		Revised	Preferred	Rs. 8750	45%	20%	74%+Rs. 10500	17.09	16236	39526	

Plastic units in Gujarat: Backward areas favoured

The Gujarat Governor, Mr. R. K. Trivedi, said that the State Government could plan for plastic industrial zones in backward areas of the State. A plastic processing zone has been established at Sarugam near Surat, he added.

Mr. Trivedi who inaugurated the annual seminar on progress through plastics in "90s" organised by the Gujarat State Plastic Manufacturers' Association, stated that rather than concentrating on urban and developed markets, the manufacturers should focus on the development of rural markets and set up units in backward areas. It should be the endeavour of the State promotional agencies to help such units to become viable, he asserted.

Mr. Trivedi pointed out that the country is in the threshold of major developments in the field of petrochemicals and plastics. The expansion is bound to be quantitative and qualitative.

The imported raw materials will be considerably reduced with the commissioning of the new petrochemical complexes. The production range is also expected to enlarge with the manufacture of more engineering plastics.

The plastic manufacturers will, therefore, have to orient themselves to possibilities of expansion and changes in production structure. But, while planning new units, one should try to avoid concentration in already congested regions.

He pointed out that the south Gujarat region, is already having a heavy concentration of chemical industries. Apart from the problems of pollution, such concentration leads to migration of people from backward areas and creation of unhealthy living conditions.

An individual entrepreneur should be

guided by advantages of facilities like transport and communications, the availability of a nearby market, etc. rather than the social cost of rural migration. This can be offset, to a large extent, by the creation of adequate infrastructural facilities by the Government agencies in backward areas, he added.

Mr. Trivedi opined that the most important sector which could benefit tremendously from the use of plastics in housing. Today, with timber getting scarcer and metal getting costlier, the developed countries are extensively using various types of plastics to substitute wood and metal in applications such as door, window frames and the like besides furnitures and fixtures.

Even from the ecological angle, pressure on forests for timber has got to be reduced and plastics could serve as saviours of our precious forests, he said.

GOVT. URGED TO CUT DUTY ON POLYMERS

The Plastics and Linoleums Export Promotion Council has expressed fear that a sudden hike in customs duty on polymers will adversely affect the production and exports by the plastic industry. It has urged the authorities to immediately bring down the duty in the interest of export promotion.

Mr. K. P. Gupta, chairman of the council, has welcomed the introduction of import duty on tonnage basis instead of ad valorem on major plastic raw materials. He, however, felt that hike in duty was unwarranted at present. It might make more units in small-scale plastic industry unhealthy, he added.

As far as exports of plastics are concerned, most of the small-scale units export under duty drawback scheme since they are not in a position to avail of the duty-free licence scheme due to

un-economic import of small quantities of raw material for export production.

Since the drawback rates have been revised upward simultaneously these SSI exporters would be much affected by the import duty increase, Mr. Gupta said.

15,000-TONNE PFY EXPORTS ALLOWED

The government has allowed export of 15,000 tonnes of polyester filament yarn (all types) in October, 1989 to March 1990, on the basis of high unit-value realisation.

The unit of measurement would be rupees or kg. f.o.b. said a public notice issued by the chief controller of imports on January 9, 1990.

DRUG PRICE REVISION PLEA HELD UP

The Union Government has frozen the disposal of pending price revision applications of the pharmaceutical industry. Since the new government came to power, price revision applications approved by officials of the Department of Chemicals and Petrochemicals, and forwarded to the Minister have not come back.

The industry is upset over the virtual freeze on price revisions which are long over due. It is under the new Petroleum and Chemicals Minister, Mr. Guruprasad aswamy, following the amalgamation of the Department of Chemicals and Petrochemicals with the Petroleum Ministry.

Every price revision has to be okayed by the Minister himself. Even the secretary does not have the power to do

Meanwhile, it is learnt that the industry has executed about 70 per cent of the Rs. 250-crore export order to the Soviet Union received last October.

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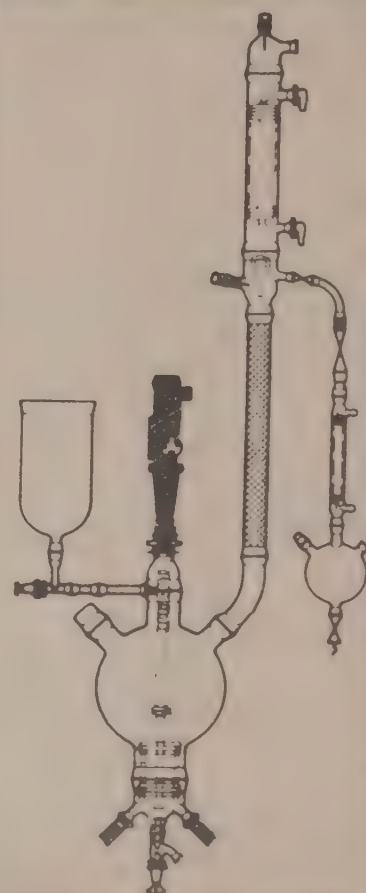
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Company Notes

THE CHEMICALS TO ACHIEVE GOOD RESULTS

Lime Chemicals Ltd. expects to achieve a turnover of Rs. 6.50 lakhs during the current year despite loss of production and damage to plant and machinery because of floods.

The working during the first quarter of the current year portends a good performance for the whole year. The company has shown significant improvements in sales and profits.

On a better reckoning, shares too appreciated from Rs. 9 in February 1989 to Rs. 35 on January 3, 1990.

During 1987, the Rs. 10 paid-up Lime Chemicals shares had moved up from a low of Rs. 9 to a high of Rs. 22.50. In 1988, despite better working results, the shares fluctuated between Rs. 8 and Rs. 13.50.

During the nine months ended March 1989 Lime Chemicals' turnover increased by 23.8 per cent (annualised) to Rs. 454 lakhs. At the same time, manufacturing and other expenses rose by 13 per cent (annualised) to Rs. 371 lakhs.

Due to better management of input costs, gross profits during the period showed a quantum jump of about 80 per cent (annualised) at Rs. 49.31 lakhs.

As compared to gross profits, profits at net level showed only a marginal rise of about 14 per cent (annualised) to Rs. 10.61 lakhs. This was due to provision of investment allowance reserves of Rs. 18 lakhs for the earlier period. The company has disputed the demand for income tax of Rs. 4.91 lakhs and has not made any provision for this.

The company paid a dividend of 11.5 per cent for nine months ended March 1989 against a dividend of 15 per

cent paid for the 12 months period ended June 30, 1988.

At an increased installed capacity, capacity utilisation for activated calcium carbonate was 80 per cent against 83 per cent in the previous year. It was 93 per cent against 97 per cent for precipitated calcium carbonate.

During the nine month period under review, the company sold 5699.34 m.t. of activated calcium carbonate at an estimated value of Rs. 280 lakhs. It also sold 4354 m.t. of precipitated calcium carbonate valued at Rs. 173 lakhs.

Lime Chemicals Ltd. a nineteen year old company entered the capital market on October 4, 1986 with a public issue of 5.10 lakhs of Rs. 10 each at par. The issue was made to part finance the capital expenditure for the expansion and modernisation of the existing unit.

The company's unit for the manufacture of calcium carbonate is situated at MIDC Industrial Area, Roha. The company's product range includes precipitated calcium carbonate — coated, uncoated and natural. These products are essential raw materials for the manufacture of toothpaste, cosmetics, rubber, PVC cables, paint, printing ink, pharmaceuticals, paper etc.

The clientele for these products include Colgate Palmolive, Geoffrey Manners, Balsara Hygiene, Asian Paints, Finolex Cables, Indian Cables, NOCIL, Cable Corporation of India, etc. The notice to shareholders states that the management has sought consent to make investments in other corporate bodies in excess of the limits laid down under Section 372.

The company intend to invest in Silvo Liacal Chemicals Pvt. Ltd. engaged in the manufacture of ethylene oxide condensates and other speciality chemicals, Thirani Chemicals Ltd. engaged in manufacture of calcium carbonate and

Regent Chemicals Ltd. engaged in manufacture of paracetamol.

GGCL SCOUTING FOR KNOW-HOW

Gujarat Gas Company Ltd., (GGCL) promoted by Gujarat Industrial Investment Corporation and Arvind Mafatlal group is looking to leading gas distribution companies of Europe, including British Gas of UK and Sofregaz of France to upgrade its own know-how in gas distribution.

Gas transmission (what Gas Authority of India is doing through the HBJ pipeline) and gas distribution involve very different technologies. The latter involves depressurising of gas to low levels and an intricate network of valves and piping to deliver gas to industrial and household consumers.

GGCL's maiden venture in Ankleshwar-Bharuch belt, using its own know-how, is in an advanced stage of implementation. Enough pipeline has been laid to connect some 5,000 households out of a projected 10,000 to be covered. Twenty-seven industrial units have signed up with GGCL for receiving gas to fire their boilers which are now using conventional fuels like coal and furnace oil according to Mr. F. B. Virani, Managing Director. The company is also providing the technical advice on changeover of fuel to gas as the boiler has to be adapted for the purpose. The company has already started distribution of natural gas in Ankleshwar and distribution in Bharuch will start by this month end. The second project under implementation is for distribution at Surat for which an initial quantity of three lakh metre cube per day has been committed by the Oil and Natural Gas Commission. Both these projects will cater to the requirements of about 7.5 lakh people and more than 1000 commercial and industrial establishment.

GGCL has plans to distribute gas to

Ahmedabad city and surrounding areas and has carried out detailed market survey and techno-commercial studies. As per the survey, about five-lakh families in the city and suburbs will switch over to piped gas. In addition, some 700 small and medium-scale units and most of the city's textile mills are expected to change over to gas.

The present requirement of the city is about two million cubic metres a day (CMD) which will go upto 2.6 million CMD by the end of century. Due to the tremendous contribution towards pollution control possible through utilisation of gas, the State Government is keen on implementation of the project at the earliest and has requested the Union Government for committing gas supply for the purpose. GGCL is prepared to implement this project expeditiously with an estimated investment of Rs. 250 crores.

The ultimate aim of GGCL is to cater to major areas in Gujarat — ideally, from Vapi to Veraval.

HOECHST, LUPIN LAB BID TO TAKEOVER GUJARAT THEMIS

Lupin Laboratories and Hoechst India have emerged as suitors for Gujarat Themis Biosyn Ltd, a sick pharmaceutical unit. Several other units were in the fray but the choice has now narrowed to these two units.

Personnel from both companies have visited the plant at Vapi and are negotiating with the Industrial Development Bank of India (IDBI), the operating agency, and are to submit detailed financial and technical proposals for reviving the unit soon.

In spite of persistent efforts by the present management, the company has not come out of the woods and has continued to make losses. Accumulated losses as on March 31, 1989, stood at Rs. 11.23 crores, eroding the net worth.

In accordance with the provisions of Section 15 of the Sick Industrial Companies (Special Provisions) Act, the company has filed a reference with the Board of Industrial and Financial Reconstruction (BIFR).

At a meeting of representatives of the company, Gujarat Industrial Investment Corporation (GIIC), financial institutions, Life Insurance Corporation of India and Union Bank of India, IDBI was appointed the operating agency to frame a revival package for the company.

For Hoechst, the acquisition will provide an opportunity for diversifying into fermentation products, an area in which the parent company is a world leader.

Lupin, like several successful Indian drug companies, has also been keen on entering this field which is less crowded, hi-tech and has tremendous export potential. The existing facilities with the addition of balancing equipment can be deployed to manufacture other bulk drugs.

Indeed, the promoter originally had proposed future diversification into rifampicin, griseofulvin and the like, but losses in erythromycin operations snuffed out these ambitions.

Gujarat Themis was promoted in the joint sector by GIIC and Chemosyn Pvt. Ltd., in 1985 by Mr. Kantilal H. Shah the moving force behind the Themis group of companies. The company has an installed capacity to manufacture 46.2 tonnes per annum of erythromycin using indigenous knowhow.

Apart from producing the bulk drug from the basic stage, it has been converting the drug into salts and formulations like erythromycin estolate and stearate. Erythromycin is used in the treatment of infections including tonsillitis, bronchitis, pneumonia and diphtheria.

During the very first year of opera-

tions, the company suffered loss to frequent power interruptions. Production was also affected because the technology developed by Hoechst required seven fermentors but only one could be installed in the beginning because of cost over-runs. The Government later permitted the company to import improved fermentation technology.

During 1987-88, production improved and the turnover stood at Rs. 5.8 crores, despite a prolonged strike by workmen. Losses, however, kept mounting.

The bid by Lupin and Hoechst heralds a new era in corporate takeovers. Pharmaceutical units, formerly regarded as companies worried about their own financial health, are now eyeing related and unrelated business. Hoechst India is on the verge of acquiring a chemical unit.

NISHA SYNTHETICS

Nisha Synthetics Limited, a company engaged in texturising and twisting polyester yarn, has started full fledged operations by commissioning its plant.

Encouraged by the favourable response received by the company's products in the market, the directors have drawn up plans for 100 per cent expansion, which will be completed during this year.

The company also plans to take up yarn dyeing at a later stage. Since yarn dyeing requires clearance from the Pollution Control Board, it may have to be undertaken at a different location. Initially, yarn dyeing capacity shall be 100 TPA and it will be increased to 200 TPA.

The company's recent public issue has received CCI approval for benefit under section 80CC of the Income Tax Act, and all the shareholders shall now be able to avail the benefit.

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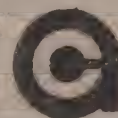
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Science Briefs

U.S. BREAKTHROUGH IN SUPER CONDUCTIVITY

Breakthrough discoveries of novel high temperature superconducting materials by the young U.S. based Indian material scientist, Dr. M.A. Subramaniam and his group at the Du Pont Research and Development Division, U.S., have been awarded U.S. patents very recently. This was announced at the International Conference on Superconductivity at Bangalore.

Dr. Subramaniam's group at the Du Pont Research and Development Department at Delaware was one of the first to discover the thallium-based high temperature superconducting oxide materials with transition temperatures of up to 125°K (-148°C) in 1988.

Specifically, the Du Pont team was the first to report the thallium-lead-barium-calcium-copper-oxide high temperature superconducting materials where thallium atoms in the crystalline structure have been substituted with lead atoms in 1:1 ratio.

Recognising that these (doped) thallium-lead copper oxides are distinctly different from the other thallium based superconductors one patent has been granted collectively for the two oxides represented by the following chemical formulae: $(\text{Tl}, \text{Pb}) \text{Sr}_2\text{CaCu}_2\text{O}_7$ and $(\text{Tl}, \text{Pb}) \text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_9$. The respective superconducting transition temperatures (T_c) are 90°K (-183°C) and 120°K (-153°C).

Lanthanum-based:

The second patent has been granted for a lanthanum-based superconducting oxide where some lanthanum atoms have been substituted with sodium atoms with the fraction of sodium ranging from 0.1 to 0.3. The formula of this compound is given as $(\text{La}, \text{Na}) \text{CuO}_4$. This superconducting phase has been found to have a T_c of about 40°K (-233°C).

The essential difference between this thallium-based compound and the other more common superconducting lanthanum compounds is that the oxygen stoichiometry is well determined: that is to say, the proportion of oxygen content is exactly known.

Superconductivity in the other lanthanum oxides was attained by having an undetermined excess of oxygen achieved through high temperature annealing of the oxide mixture in a high pressure oxygen environment.

In contrast, here the necessary electronic property in the crystal structure required for high T_c is sought by Dr. Subramaniam to be achieved in the cationic sector of the compound: by adding sodium in undetermined proportions. And this has been found to make preparation of the material much easier than high pressure annealing in an oxygen atmosphere.

Though Prof. C. N. R. Rao is reported to have found these thallium-based superconducting phases at around the same time the publication of Dr. Subramaniam's results were much before Prof. Rao's. Incidentally, Dr. Subramaniam is a former student of the IIT, Madras, having worked under Prof. G. V. Subba Rao in the Materials Sciences Department of the Institute.

Delivering an invited talk at the Conference on "High T_c Superconductors: Structures, defects, non-stoichiometry and T_c correlations", Dr. Subramaniam pointed to an interesting empirical observation which gives a sort of thumb rule to fabricate new materials with high superconducting transition temperatures.

His observation is that all the superconducting materials so far discovered seem to have a very small value range for the attribute known as electronegativity. The range in which all the materials have been found to fall is: 2.64

to 2.66.

Mixed valency property:

There are textbook rules for calculating this quantity in compounds like the new copper oxide high T_c materials. Electronegativity in these materials gives a measure of the effective negative charge on the group of radicals apart from the copper atoms, or equivalently, this is a measure of the positive charge state of copper in the crystal structure of the material which does not have a fixed value.

This mixed valency property as it is called, whether a copper atom is in a +2 charge state or in a +3 charge state, is known to play a very important role in high temperature superconductivity.

Therefore, if Dr. Subramaniam is right all that is required is to sit with Pauling's electronegativity formula and work out which atoms would do the trick of producing a compound with an average electronegativity that falls in the empirical range.

This empirical relation is not surprising because it is related to the proximity of copper and oxygen atoms in the active copper-oxide layers in the crystal lattice, known to be crucial for high T_c . But it is good to have a cooking recipe for high T_c , is what Dr. Subramaniam says.

Another prominent U.S. based Indian scientist in the field of high temperature superconductivity and attached to a corporate research and development setup is Dr. Pravin Chaudhuri of the IBM Research Division, Yorktown Heights, New York. He is part of a National Committee on Superconductivity formed by the U.S. President, Mr. George Bush, which will be submitting a report within a few months to the U.S. Congress recommending how the U.S. Government should plan to use the research done in the U.S. industry and research laboratories.

National efforts in U.S.:

Dr. Chaudhuri and his colleagues at the IBM were the first to report the highest current densities of about a million amperes/sq.cm. in these novel superconducting oxide materials fairly in the game.

Talking on the nature of the national efforts in the U.S. in the field, Dr. Chaudhuri said that a consortium of companies and national laboratories has been formed, based on the recommendation made by the so-called Weismann Commission set up by the former President, Mr. Ronald Reagan. The consortium consists of the important American institutions like the IBM, AT & T, Bell Laboratories, MIT, Lincoln Laboratories, Du Pont, Los Alamos National Laboratory and others.

The consortium was formed after all the financial, legal and technology transfer aspects were taken care of, according to Dr. Chaudhuri. An estimated funding to the extent of \$140 millions from the U.S. Government and \$100 millions from the U.S. industry towards superconductivity research for the next year is being envisaged in the Committee's report.

Levitation transport vistas:

Apart from the electronics and the power sector industries, aerospace industry has also evinced keen interest in the area, Dr. Chaudhuri said.

However, the surface transport industry has shown very little interest in the magnetic levitation transport possibilities unlike as in Japan. Apart from the New York Senator, Mr. Moynihan there is no obvious interest from anywhere else, he said.

"The issue is not whether levitation is possible that certainly is. The question is whether one wants to do it," Dr. Chaudhuri said. Incidentally, Du Pont is also part of the Japanese consortium, through the Japanese subsidiary Du Pont (Japan), according to Dr. Subra-

maniam.

Talking of directions in basic research in the U.S. Dr. Chaudhuri said that material issues are still open though the so-called 123 compounds based on yttrium oxide are the easiest to prepare. Second in line are the bismuth-based compounds, he said. Through thallium compounds are toxic and therefore not preferred for large scale applications, they are likely to be exploited by small companies for applications like coating the insides of RF resonance cavities, he pointed out.

False alarm:

There has been steady progress in the U.S. in achieving high current densities in these oxide materials, he said. Dr. Chaudhuri feels that it was a false alarm in 1987 that high critical currents could be obtained only in thin foils. Very high current densities have been obtained in almost all single crystals of these oxide materials, he pointed out. In polycrystalline materials at 77K current densities as high as 6-8 million amperes/sq.cm. have been obtained at zero magnetic field, Dr. Chaudhuri said.

He referred to some recent work in Japan which had shown that in crystalline wires current densities higher than conventional low temperature superconductors could be obtained.

As regards field dependent current densities he pointed out to the significance of the recent work where in an oxide super conductor at 4K under a magnetic field of 25 tesla higher current densities than conventional metallic superconductor values had been obtained.

Scope for R & D in India

Indians can carve a niche in the global superconductivity scenario by channelising talent towards a few projects in the field, according to Dr. Chaudhuri. In an interview, he said the country should not only draw a long term programme for superconductivity

research and applications, but also a handful of ventures to make a mark in the international scene in the future. "The strategy should not be to race with the big countries in the field but choose a few areas", he added.

He said the country could concentrate on fabrication of squids (superconducting quantum interference devices) which were state-of-the-art and market ready for applications in medicine, geology and instrumentation. The experience gained in making squids could be used to produce superconductors, with applications in computer applications.

Dr. Chaudhuri said he and his colleagues at the IBM Research Centre, Yorktown Heights, New York, were the first to make a squid. The team, however, was working for the last three years to overcome certain "practical problems" in utilising squids in contraptions that had commercial applications. India could use a large number of scientists for making squids, he added.

Dr. Chaudhuri said IBM proposed to use the squids as "learning vehicles" for application of superconductors in computers. As the market for squids is too small for IBM, it might give the technology to the US Navy for detection of submarines or permit licensed manufacture by small units, he added.

He said the first batch of superconductors for commercial use in the area of medicine, geology and microwave communications would be out in the next two years. He said he was currently studying why "grain boundaries" in superconducting wires and films limit their low current carrying capacities. If this problem was not overcome, scientists would have to derive newer methods of making the wire and films.

Dr. Chaudhuri said the magnetic lattice problem in superconductors, which raised the sceptics was only a "red herring". Even the brittleness and other problems of these systems could be solved, he added.

Lab-to-industry move in sight

The hot superconductor technology is poised to move from laboratories to industries with several Indian companies wanting to exploit the new technology, it was reported at the world conference on superconductivity.

The Bharat Heavy Electricals Ltd. (BHEL) has taken up a project to build a 6-MA generator using superconducting coils. In a paper at the meet, Dr. C. Lahiri and his colleagues at BHEL said coils made of high-temperature superconductors (HTSC) would reduce size and weight of a generator by half and increase efficiency by one per cent 'saving several millions of rupees over the life of the generator'. BHEL is also examining possible HTSC applications for transmission cables and magnets for imaging and particle accelerators, he said.

Indian companies are moving into this emerging area under the thrust given by the Superconductivity Programme Management Board headed by Prof. C.N.R. Rao, director of the Indian Institute of Science, Bangalore.

Dr. Mihir Sen of Burn Standard Company said, using superconducting magnets, silica impurity can be separated from Salem ores saving several million rupees of foreign exchange.

Dr. R. Dhawan, Tata Electric Company said TEC is watching world progress in HTSC and would move in at the right time.

Meanwhile at least three Indian laboratories claim to have developed sensitive magnetic 'sensors' called 'squids' (superconducting quantum interference devices) that can be used for mapping magnetic fields of the human brain and surveying the earth's magnetic anomalies for oil exploration.

Dr. S. K. Arora of National Physical Laboratories, Delhi said the 'squid' developed at NPL using HTSC mater-

ial functions at liquid nitrogen temperature (-193°C).

Scientists at the solid state physics laboratory in New Delhi reported the development of infra-red detectors using high temperature superconducting thin films produced in the laboratory, in infra-red detectors have applications in space.

Scientists at the Benaras Hindu University said they have developed a technique for making screen printed thick films on ceramic substrates. The final product was found to be superconducting up to a temperature of -163°C .

Meanwhile, a scientist of the National Physical Laboratory (NPL), Dr. A. V. Narlihar, claimed to have found the hottest superconductor but participants of the world conference on superconductivity were sceptical.

Shock treatment for conductivity

One shudders at the mention of explosions capable of blowing apart everything in sight, but not so for some scientists who have learnt to make use of the resulting shock waves to make better superconductors.

Scientists at the American multinational company, Allied Signal, are devising ways to channelise these shock waves to develop superconducting cables which are capable of transmitting electricity without any loss.

Dr. Zafar Iqbal, a senior researcher at Signal, who was in Bangalore to attend the international conference on superconductivity, said they have been able fabricate superconducting cable, with copper covering.

In their laboratory, explosions are created in a protected chamber. The shock waves created during the explosions generate very high pressure. Under the impact, the superconducting material is compressed to form thick cables. Through appropriate methods, it

is possible to blend copper which forms the outer layer. This cable could be used to transmit electricity without any loss.

Superconductivity is a phenomenon by which certain materials offer no resistance to flow of electricity, unlike the modern-day metallic conductor, at a particular temperature known as critical temperature (TC). The highest TC achieved till today is 125 degrees Kelvin or -140°C Centigrade. For practical applications TC has to be much higher and this is what scientists across the world are trying to achieve.

It need not be so, says Dr. Iqbal. His team is working towards enhancing the current-carrying capacity of superconducting cables rather than the TC which they think is more crucial.

They have been successful to some extent during the experiments. "We will be able to raise this in the near future", he says optimistically.

Another attempt is to make superconducting alloys, similar to metallic alloys. "This way we can take advantage of different materials exhibiting superconductivity."

Allied Signal has a \$ 500-million defence ministry-sponsored project to develop superconducting motors with bearings made out of these materials. Such motors will be frictionless and could be used for levitating trains as well as in many military equipment.

Regarding the initial euphoria, when high-temperature superconductors were first claimed in 1986, Dr. Iqbal said, "it is dying out. Now it is just restrained excitement."

Future Prospects:

Sections of hospitals of the future may sport a new look. If all goes well, they will have screening-rooms constructed for superconducting materials. Such rooms will have no magnetic fields and will facilitate more accurate

diagnoses of ailments of the heart, blood and the brain, says Dr. M. Cardadona, a German physicist.

When even the earth's natural magnetic field is absent in these rooms, it would be possible to detect the field created by the patient's blood circulation and make accurate diagnosis.

Medical diagnostics would be revolutionised and there would be no need to use catheters, inserted into the heart, to learn more about it. This could be done using a superconducting magneto-cardiogram, thus eliminating the dangerous effects of inserting a catheter.

The other limiting factor could be the costs involved in maintaining the superconducting screening rooms at temperature much below the freezing point to take advantage of the phenomenon.

NEED FOR INTEGRATED STUDY OF GREENHOUSE EFFECT

There is a great need for integrated study and to generate more data on the various aspects of global warming and sealevel rise--the direct consequence of greenhouse effect. Scientists and technologists should take up more detailed and quantitative studies in relation to the Montreal Protocol, and come out with the right energy mix and more green and safe energy options.

Exploration of marine resources and flood modelling using space vessels and the study of the impact of deforestation on monsoon behaviour as also on conventional rains should be initiated. An integrated and holistic conservation strategy to preserve the biological diversity is another urgent need.

These are some of the recommendations of the two day national symposium on Indian Geosphere and Biosphere programme organised by the National Academy of Sciences recently at Hyderabad.

Dr. M. S. Swaminathan, president of the academy in his presidential address highlighted the future challenges that humankind would have to face, and urged the need to protect the natural resources to ensure livelihood security for the generations to come. "If we do not act now, we will all be in serious difficulty, he cautioned.

Reliable scientific basis essential:

Prof. M. G. K. Menon, Union Minister of State for Science and Technology, who inaugurated the symposium outlined the objectives of the International Geosphere and Biosphere Programme (IGBP) launched by the International Council of Scientific Unions (ICSU), and stressed the necessity to develop indigenous knowledge base.

"It is essential to have reliable scientific basis. It is an enormously difficult problem, and calls for a new approach and cooperation from the scientists. Such efforts should be supported nationally and internationally," he said.

Scientists have clear evidence on the implications of greenhouse effect, and on the depletion of ozone layer due to the emissions of dangerous gases. The change in the global temperatures and sealevels were not subject to national boundaries.

Serious and irreversible cataclysmic changes could result out of excessive human activities, and the world scientific community should come together to study and monitor the changes that were likely to take place, according to him.

Dr. A. P. Mitra, Director-General, CSIR (Council of Scientific and Industrial Research), presented an overview of the middle atmosphere chemistry, and highlighted the features of tropical atmosphere. He spelt out the ozone measurement statistics in the country, and said that certain new forms of chlorofluoro carbons were relatively safer

than others.

Well away from precise understanding:

Dr. Anna Mani of the Raman Research Institute, Bangalore, presenting a paper on "the earth's atmospheric radiation budget" pointed out that scientists were still far from precise understanding of the general balance of energy on earth. There had been no significant change in ozone level over India, she pointed out.

Dr. U.R. Rao, Chairman, Space Commission, described how the remote sensing satellite imagery helped in measuring the forest cover, degraded land and fisheries wealth. Satellite pictures provide valuable information on resource base, and they can be used for preparing plans for sustainable management of the natural resources according to him.

Dr. Merher Homji, of the French Institute, Pondicherry, dwelling on the relationship between the deforestation and declining rainfall said that it was clear that the distribution and precipitation was decided by the type of vegetative pattern.

He described the role of forests as a receptor and generator of rainfall. In South America, scientists have established that forests have the capacity to recycle rainfall by conserving rainwater and sending them back into atmosphere through evapo-transpiration.

Dr. T.N. Khoshoo, former secretary to the department of Environment, New Delhi, speaking on biological diversity and the need to protect biosphere said that though the country had done well in ex-situ conservation, very little effort had been put in for in-situ conservation.

He stressed the importance of biological diversity, and pointed out how the 'gene rich' developing countries could provide valuable genetic material for modern biotechnological research.

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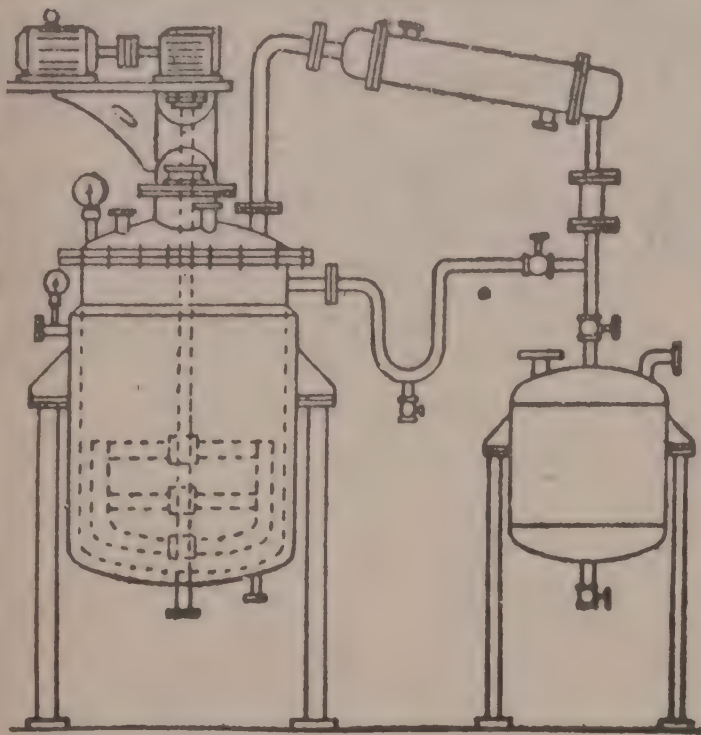
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Coastal Pollution Control — Equipment, Planning and Training*

Captain Robin B. Middleton, F.N.I., Brigs Marine Environmental Services Ltd.

Synopsis

The paper is written in six sections, highlighting the various aspects of pollution control legislation in different countries stemming from the early oil spill disasters of the 1960's in European waters. The progression since those days has varied from country to country and much of the planning has depended on the environmental issues and type of coastline liable to contamination. The initial overview of the paper touches on events as recent as the Piper Alpha tragedy in the North Sea and the requirement because of this incident for the British Government to alter its approach to oil spill clean up.

Sections 4 to 6 look at the options available to deal with any oil spill, i.e. use of dispersants, the use of containment and recovery systems, contingency planning and training aspects. Having given descriptions of the equipment which is available for dealing with oil spills, the importance of proper contingency planning and training of the personnel concerned with using oil spill contingency plans in the event of emergencies is highlighted.

Overview

In general terms, awareness of the threat to the coastline of Great Britain came to the fore in 1967 at the time of the Torrey Canyon disaster off Lands' End. People became aware of the effect of large quantities of oil floating on the surface of the sea, as a pollution threat to the country's shorelines. Inlets, estuaries, bird and marine life can all be upset on a long or short-term basis and this whole environment is — as I like to think of it — 'that small part of the world which we must look after'.

In Britain, the Duke of Edinburgh perhaps came up with the most rounded philosophy of this subject when he said "we do not inherit this earth from our parents, we borrow it from our children". As members of an industry which deals with extraction of hydrocarbons from sea areas and the safe transport of these hydrocarbons onshore, we have a responsibility to ensure that when it comes to resultant damage to 'our part of the world' from these operations we

- know what we are talking about and
- know what to do in the event of an emergency

A map of Europe with the locations of major oil spillages in the 1970s would show us concentrations of spillage in areas of heavy shipping traffic. It is not surprising to find now that

awareness is far more acute and ability to respond to spillage is better prepared in these spots than in other, more remote areas of Europe. The massive spillage caused by the Amoco Cadiz off the coast of Brittany caused a surge forward in manufacture of oil retention booms and recovery systems in France and such development is apparent in all the other countries where a similar impact has been suffered.

Many of the areas in which exploration drilling for oil is carried out may appear to be in remote locations. Government planners from time to time rest on their laurels, knowing that the computers and consultants have 'worked it all out' and how many times do we hear phrases like "it could never impact this coasts?" If 'it' is nice, clear, fresh oil, this may be true, but in 1987 we saw five miles of emulsified oil across the North Sea in seven days, breaking all records and beating any computer prediction so far.

The oil industry in Britain was quoted recently as having the most responsible attitude towards conservation and was named as the industry which works in closest liaison with environmental bodies. This may be because we are — or should I say because some companies and governments are — very aware of the environmental, financial and health consequence of major spillage and contamination of coastal sea areas, just as those people on the French and English coastlines of the English Channel are.

We will look in this paper at the possible sources of spillage and at the equipment available to deal with such spillage and try to link these factors up with contingency planning, a method of training people to deal with such a disaster and the requirement for good government legislation and policy.

Sources

We have already mentioned the Amoco Cadiz and Torrey Canyon and also in Ireland the explosion on the massive tanker Betelgeuse at Bantry Bay springs to mind immediately. Within the oil industry we have the capacity to cause serious pollution, whether it be by major blowout, during well testing and flaring periods, or through domestic spillage in inshore and sensitive areas.

The effect of oil and chemical pollution in the water column may well have a long-lasting effect on the marine ecosystem and food chain and this has become very apparent in recent months in British waters. The seal community suffered mass illness and death from a disease normally found in dogs, but able to pass through the seals' immune system which had

* Paper presented at the Oil, Gas and Petrochemical Seminar, New Delhi, January 1989.

apparently broken down, possibly through a deterioration caused by toxic poisoning at sea. A large budget is being earmarked within the European countries to monitor, test and find out exactly what the extent of damage to the marine environment is to date. The effects of spillage and waste in sea areas must therefore be taken extremely seriously when it seems that the long term effect of such pollution can have a devastating effect not only in the marine food chain, but also on the health and well-being of the world's human population.

The most famous blow-outs so far have been in the North Sea (Ekofisk) and in the Gulf of Mexico (Ixtoc), and more recently of course there was limited pollution from Piper Alpha. There is another very famous well which has been spilling oil out for a long period of time and that is Norwuz in the Arabian Gulf. In this case, the damage to marine life and the terrible imbalance against nature has been forgotten in the face of prolonged warfare. The healing process in that area, after hostility does finish, could take 100 years before the long-term balance of nature allows present marine life to return to normal. Within the offshore oil industry, we must consider blow-out, pipeline fracture, catastrophic accident and intentional or accidental discharge and clearly understand the need for environmental protection and the method of cleaning up any pollution caused by our industry.

Legislation & Government policy

The legislation covering oil pollution at sea can be broken into three parts:

1. The Recruitments under a Marpol Convention accepted by those countries who are signatories.
2. Local government legislation concerning the prevention of oil pollution.
3. Monitoring of offshore discharges of hydrocarbons.

The other item of legislation concerning oil spill clean-up is the classification and construction of vessels suitable for recovery of oil.

Relationship with neighbouring countries

An example of friction caused by differing Government policy is highlighted in the relationship between the British Government and neighbouring Governments in Scandinavia about the use of dispersant in large quantities to deal with North Sea oil spills. British policy has for many years (since the days of Ekofisk) been to "leave oil alone because it will not land in any quantity after natural dispersion, water circulation and evaporation in the North Sea, or dispersion by aerial spraying".

The Norwegian Government does not allow the use of dispersant in coastal waters in any quantity and has opted for a positive clean-up and removal of oil and debris from the sea in the event of spillage. The two countries have grown

apart in response tactics, both in economic and practical

1. The British Government used their pollution clean-up budget to purchase stocks of dispersant and to charter a fleet of oil recovery planes.
2. UKOOA (United Kingdom Offshore Operators Association) Clean Seas Committee followed suit but adopted a shipboard dispersant spraying capability on a collective basis between the 30-odd participating oil companies. They in turn have made a major investment in dispersant stocks.
3. The Norwegian Government, however put the onus on the oil companies and local regions to set up oil spill clean-up response bases along the coastline, thus making alternative use of the equivalent UKOOA investment in dispersant, which costs about £1,000 per tonne and has a shelf life of about seven years.

During the recent Piper Alpha incident, the British response was to mobilise UKOOA stocks of dispersant as well as commercial stocks quickly available in Aberdeen and to have some 200 tonnes of dispersant on field and up to 350 tonnes available at Aberdeen. Midway through the operation, the Norwegian Government and the British Ministry of Agriculture, Fisheries and Food (MAFF) condemned the use of such vast quantities of dispersant because of the effect of sinking of oil and dispersant would have on the longterm marine ecosystem in the North Sea.

It may well be that such sensitivity would now be ten-fold after the recent incidence of illness in the seal community. At this point during Piper Alpha, the Government and Occidental Petroleum had to turn quickly to commercial companies to find out what, if anything, Britain could offer to physically collect and remove oil should this become necessary.

A response was available through the commercially run joint resources of Briggs Marine Oil Industry Call-out Club, a facility, Alba International in Aberdeen and the back-up of BOSCA British Oil Spill Control Association, which is a commercial body and part of the British Marine Equipment Council (BMEC). Several thousand metres of oceanic boom as well as an oil collection capability of several hundred tonnes per hour, were found to be available to the company. This was in addition to one kilometre of boom and a 160 tonne per hour oil recovery already on field on board the pollution control vessel, MV Forth Explorer, and also a three-weir boom system capable of recovering 160 tonnes per hour of emulsified oil which was available from BP Petroleum Development.

Conclusion

Argument and hypothesis about the fate of spilled oil does not help the environment into which the oil has been spilled

and perhaps the simplistic but most simple response is just to clean the oil up anyway and argue about effects at a later date. If the oil is recovered, the environment is safe from both the practical effects of the spill and also from the prolonged speculation about what it might do to the environment if dispersed or left alone.

When oil is dispersed, the bulk is reduced into droplets, which will sink into the water column. This is quite reassuring outwardly, because the oil is removed from the surface of the ocean. If the water column is deep and healthily active, the oil will degrade and disappear. However, if there is not a large enough area of subsea water column to bring about this natural dispersion, contamination on a long-term basis can commence.

Many people have said in the past that recovery of oil is not an option because of the weather restrictions at sea. This leans towards the negative and, throughout the 30-day period, while MV Forth Explorer was recently on the Piper Alpha field in the middle of the North Sea, she could have recovered oil (although after the first few days, there was little to deal with) in the weather conditions prevailing on 24 of the 30-day operation. The negative thinkers would no doubt add "yes, but we could have been working in a monsoon..." If we are to be positive about the matter, we must look to our ability to be able to recover oil whenever possible and start any policy from this point. The next part of this paper looks at the options open to us.

Equipment

Of the three options available to deal with any oil spill, i.e.

- * the use of dispersants
- * the use of containment and recovery systems
- * or 'leave it alone to disperse naturally'

two involve the use of equipment and hence personnel trained in the use of that equipment and able to operate it at a moment's notice. This in turn produces an industry loosely called 'the pollution control industry' we shall look in this section at these options and find out what is available to deal with oil spillage.

Dispersant spraying

Dispersant is a surfactant, or if you like, a surface active agent, designed to break down the surface tension which holds oil as a mass and to form droplets of oil which will fall into the water column to be devoured in a natural process. Early dispersants, unfortunately, added a great deal of toxicity to the oil during this breakdown period, but this has largely been overcome through trial and experience, and those dispersants which may be used around the British Isles are now all tested and approved by Warren Spring Laboratory and the Ministry of Agriculture, Fisheries and Food. In early days, dilute dispersants were used in conjunction with breaker boards

which were dragged behind the spraying vessel to assist in the breakup of the oily mass. This practice was cumbersome, back-breaking and extremely dangerous in all weather conditions and has, thankfully, been replaced by the use of more sophisticated mixing pumps, wide spray arms and concentrate dispersants of acceptable toxicity levels. Concentrate dispersants can also be used in aerial spraying, either from specially fitted out low-flying aircraft or helicopter spray pads.

When dispersants are used, it must be remembered that they are only really effective in light oils, freshly spilled oil and, therefore, effectively as a first line of defence against the spread of oil spillage. It is normal for approximately 60% of the light ends of oil to evaporate within the first 10 to 12 hours after a spillage and the effectiveness of dispersants becomes very much less thereafter, thus outweighing the consideration for continued use. It is also inadvisable to use dispersants where the water column, i.e. depth of water, is insufficient for droplets of oil to be effectively broken down by natural processes.

In summarising the use of dispersants, it is to be noted that the effect of modern, concentrate dispersants is extremely dramatic in reducing the amount of a mass of spilled oil and therefore highly commendable when it is possible to attack it at source in deep ocean locations. Dispersants may also be used (with due consideration to local fishery and seafood activities) in inshore areas to assist rough water tidal regimes to degrade oil, but never in areas of 20 metres or less or within one mile of such areas without prior consultation and advice from fishery or government bodies.

Many other chemicals have been produced in recent years, such as oil marshalling agents which can be used to advantage when attempting to protect or pre-empt the effects of impacted oil on coastal areas. The subject of dispersants and chemicals could be the content of an entire seminar and the author would suggest that for further information, members refer to the Institute of Petroleum's Second Edition Guidelines on the Use of Oil Dispersants.

Containment booms

There is on the market a vast range of oil spill containment booms, varying from the very largest (approximately 100 metre above and below the water) to the smallest harbour boom which can be no more than a ship's rope floating on the water. Indeed, many African villages in coastal waters protect themselves with booms made by local village people from straw and other such vegetable matter. Straw in this manner can become extremely effective, as oil also sticks to it and can therefore produce a living, growing protection barrier. During the years since the Torrey Canyon, inventors have lived in a dream world, each one coming up with a boom or piece of equipment which they felt placed them in the position of

chief guru in the pollution control industry. What most fail to grasp is that (a) every boom has its restrictions and (b) every boom is designed for a specific purpose.

Ocean booms

Considerations when selecting a boom for use in the open ocean are their flexibility and durability, aligned with one another's ability to stay afloat. The major ocean booms are normally air inflated (at low pressure) and available either in sections which are inflated individually during deployment, or in a continuous air and water tube supplying buoyancy and ballasting. The wave riding ability of the continuous tube is probably better than that of the sectional type, which is bound to have some degree of rigidity.

The expertise required, however, to maintain continuous inflatable boom is very much higher and obviously requiring a mother vessel of some description to maintain pumping. Manufacturers of the slightly more rigid booms may however point out that the loss of a little oil in the middle of the ocean as a result of this rigidity is not really going to worry anyone.

During the early days when such booms were used, we and many others attempted to form configurations such as the 'U' and 'J' shapes, dragging booms between ships. Such action is only effective at speeds of less than half a knot, and it soon became apparent that when dealing with oil on the ocean, the best approach was to surround a mass of oil with the boom and return the other end to the collection vessel, thus allowing the ship, boom and oil to float round the ocean at will. We then gently pull the boom towards the recovery vessel to ensure an ample supply of oil at the skimmer point. The motto of such an operation is that every tonne recovered is a tonne less to clean up ashore. Coastal booms tend to be a slightly more junior version of the large ocean booms and, in principle, are used in the same way to contain oil.

Harbour and inshore booms

In still waters, protected from weather, little need be said about the effectiveness of small harbour booms other than that they start with the ship's mooring rope and get progressively better (if not always easier to deploy). In areas outside a protected environment, the effectiveness of booms depends entirely on the expertise of the person deploying them as, in general, they will be totally ineffective against weather, sea and current. In the hands of a well-trained person, they can be anchored in such a way as to divert oil to the most suitable collection point and can also be used to stop oil exporting itself from a sheltered corner or area of a beach, estuary or port.

Oil sorbent booms

There are various makes of boom and other sorbent mater-

ials which will not only corral oil in calm water, but absorb hydrocarbon materials and contain them within boom's structure while rejecting any absorption of wa-

Oil recovery equipment

Having corralled the oil spillage to a collection point, must now turn our attention to separating the oil from ocean and to do this, the inventors have designed piece of equipment which will lift the oil into the recovery vessel and leave most of the ocean where it is. There are four main ways of doing this:

1. Floating suction heads.
2. Use of oleophilic surfaces.
3. Weir systems.
4. Sorbent materials.

1. Floating suction heads are normally part of a vacuum system and it can be assumed that recovery will be in the 40-60 ratio of oil and water.

2. Oleophilic surfaces, i.e. disc skimmers and rope mop. Oil sticks to these surfaces while water does not. The usual construction of such recovery systems is either disc skimmer or rope mop. Disk skimmers consist of banks of vertical discs which turn in the water and oil, picking up the oil but not the water. The oil is scraped off the disc into a sump within the skimmer head and then pumped to the recovery vessel. Oil rope/oil mop systems use the same principle, being made out of rope to which oil attaches, but water does not. The ropes interface with oil and water and then pass through roller systems which squeeze the oil again into a sump for pumping to the oil recovery vessel.

3. Weir systems are as suggested a skimmer head which is adjusted to accept floating oil into a pumping system. The latest advance on this front is the Vikoma Weirboom Systems which incorporates a weir pumping system into an air and water boom and which pumps the oil collected along a third chamber into the collection vessel.

4. Sorbent materials are materials which absorb oil and retain it. The better of these materials can also reject water totally and hold up to 20 times their own weight of oil for weeks while remaining afloat. Materials such as this can be placed in interceptors, drainage areas and indeed in rivers and open waters. They are also used for clean up of lube oil which does not respond to dispersant.

Contingency planning

Contingency plans are of utmost importance both at national and local operational level. This is an area, however, where confusion reigns in many areas of Europe. I have found during periods of consultancy that up to four contingency plans exist for one little corner of Britain and that the

ners of each one were unaware of the existence of the
ers. This means that unless plans are monitored by one
y, and the responsibilities of local agencies defined quite
arly, in relationship to each other and for instance the oil
ustry, a situation of confusion can easily occur. The impor-
ce of having such a monitoring body also comes to light
he style and language of such plans. A contingency plan
s to be used by people under stress and must clearly tell
se people 'what to do' and also why.

The content of the plan is something which must be con-
ered very carefully and will vary to a certain extent, though
efully not in format to meet the requirements of each situa-
n. The importance of a single format is that the plan must
d the person where to get help and what is available to them,
d that person if trained in this field of work should recog-
nise the format of the plan and be able to turn to the rel-
vant section with ease rather than as a matter of search and
nd. The person dealing with the plan must be someone who
as had training in this type of response and also knows some-
ing about the options available for dealing with spilled oil.
his brings us to the subject of training.

Oil spill training

Training personnel, means educating and teaching them
o respond:

in a manner which will put into action the proper chain
of events

to do this the duty person must have an understanding of
their Oil Spill Contingency Plan

the duty person must be able to assess the requirements
of the situation

During the past six years, we have as a company, trained
several hundred people both in the practical aspects of pollu-
tion control, and more and more in recent years in the phi-
losophy behind response and contingency planning. It is very

important to teach people to mobilise equipment for which
they are responsible, but it does not serve much purpose if
a person uses an ocean boom once in training and then tries
to deploy the same boom from memory two years later.

Our training in the use of equipment is pointed more at
evaluation and knowledge of the time and difficulty involved
in deploying a certain item. This also assists in budgeting
and planning when selection of equipment is made. It is
important that the person making such selection is aware of
the limitations of the equipment. Contingency planning and
response management are the factors which we feel are very
important. The laws, the relationships between the four people
mentioned earlier, each with their own contingency plan are
the basis for policy, budget and manning.

It is very much easier for the Consultant or Operations
Superintendent of a response company to deal with people
who understand what is the best way of dealing with a situa-
tion, people who realise that their actions will be scrutinised
by underwriters, government ministers, legal departments and
most importantly, the press and public at large. We have
found that the best coverage for such training can be achieved
through seminars both offshore on installations (where the
spillage and reporting procedures may begin) and follow-
ing the path of the spill through shore operations and senior
management to government level.

The other effective training course is the team method of
approaching an area scenario, planning, budgeting, writing a
contingency plan and then testing to destruction the resultant
response. To close with, we should define the difference be-
tween crisis management and management of crisis. Trained
personnel with the correct knowledge, philosophy and equip-
ment will manage a crisis. We all know and have probably
experienced crisis management. There should be no doubt
what we aim for within our own framework of responsibility.

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Sensory evaluation: matters of taste

Dr. HAL MACFIE

Department of Food Acceptability, UK Agricultural and Food Research Council,
Institute of Food Research, Reading Laboratory.

Essential to any investigation of the eating quality of foods and the design of new food products is the effective measurement of sensory properties such as appearance, texture, aroma, flavour and taste. The process by which panels of people are used as instruments for this task is known as sensory evaluation. Recent advances in sensory methodology have greatly enhanced the quality and broadened the scope of information that can be extracted from such laboratory panels. Research effort is now aimed at relating sensory properties measured in this way to acceptability as evinced by consumers, taking into account individual preferences.

In the study of the properties of foods it is very important to distinguish between their physical and chemical properties, their sensory qualities, and their acceptability. Physical and chemical properties are measured by instruments that in no way mimic the eating process, so the data do not necessarily relate to the eating quality; that is measured by a sensory panel, made up of people selected for their sensory acuity and ability to articulate the sensations they experience while viewing, smelling and eating or drinking the food. They are not usually asked to say how much they like a particular product, for preference scores by a few individuals who have been asked to dissect their sensory perceptions are not likely to represent the population view. Preference or acceptability is scored by consumers in tests at home or in halls where preparation and lighting conditions can be more closely controlled.

Once these distinctions have been made, it is obvious that an important aim of food research must be to see how far *liking* of a product by consumers can be explained in terms of its *sensory* qualities and how well the sensory qualities can be explained in terms of the physical and chemical properties.

One problem with sensory evaluation, as distinct from other scientific disciplines in food research, is that the human being is an extremely complex measuring instrument, subject to a great deal of environmental variation and noise. The level of measurement achieved is sometimes no more than rankings or simple classification of samples into groups, while on other occasions very detailed descriptions and quantifications can be produced. For this reason certain new statistical approaches have been derived for the analysis and presentation of sensory evaluation data and for relating the data to the other aspects.

Sensory panels perform three main tasks, namely discrimination, recognition and description. In a discrimination the assessor may have to select the odd sample out of three where two are the same. This is known as a triangle test. In a recognition task the assessor may be asked merely to identify whether a particular property is present or not. Neither generates a great deal of data. However, in a description the assessor may score a product for the intensity of any of 10 attributes for each of the general sensory classifications of appearance, texture, flavour and taste. In a typical session each assessor may evaluate four to six samples; there may be four such sessions in a morning sequence. Sensory units now tend to employ professional tasters instead of members of staff, and with a typical sensory panel of 10 people it can be seen that a morning session produces up to 400 of 12,000 numbers. Multiply that by three to take account of a typical week's work, and it becomes easy to understand why most sensory units are now installing personal computers in each sensory booth.

Our Institute has developed its own software to collect data from category scoring, line scoring (in which assessors mark points on a line which has end labels equivalent to nil and extreme) or free choice profiling (described later), all based on a network of BBC microcomputers. The software is being marketed by Reading Scientific Services and is also available on IBM PCs.

Analysing sensory data poses special problems, which are addressed with a software package called SENPAK, developed for use in the sensory laboratory. With this, the experimenter first investigates the performances of the individual assessors by calculating their discrimination and comparing their scores with those of the rest of the panel. When assessors are found to be inconsistent, it means they are probably distorting the panel data, so their individual data is removed from the analysis. The package then calculates panel averages and submits them to a multivariate statistic technique that produces maps of the samples and the correlation structure among the descriptors, as shown in the illustration relating to tomato soup. SENPAK is widely used in sensory work and is available in BASIC and PASCAL programming languages.

Free choice profiling

Descriptive profiling uses a fixed set of descriptors to characterise a product. They are usually selected by the taste panel during time consuming training sessions. One recurring pro-

with profiles is that individual panellists use different descriptors to describe the same sensations. Examples of such confusion are 'bitter', 'stale' and 'sour'.

Free choice profiling has been developed within the Agricultural and Food Research Council as an elegant and novel solution to the problem of confusion over the meanings of such words. It offers the opportunity to shorten training sessions or do away with them altogether. Using this system, each panellist or consumer allocates scores for all samples giving his or her individual profile. The profiles are then brought together and averaged using a complex mathematical technique, also developed within the AFRC, called Generalised Procrustes Analysis (GPA). Its basic rationale is that if the patterns of dissimilarities among the samples do not differ greatly across the panel, it can be assumed that the panellists are perceiving the same sensory properties regardless of what they call them. The inter-relations among the descriptors used by the various individuals are revealed by showing what correlation they have with principal dimensions of the averaged samples configuration produced by GPA.

Free choice profiling has already been successfully applied to a broad range of products including porks, coffee, processed cheese analogues and irradiated turkey, as well as to the

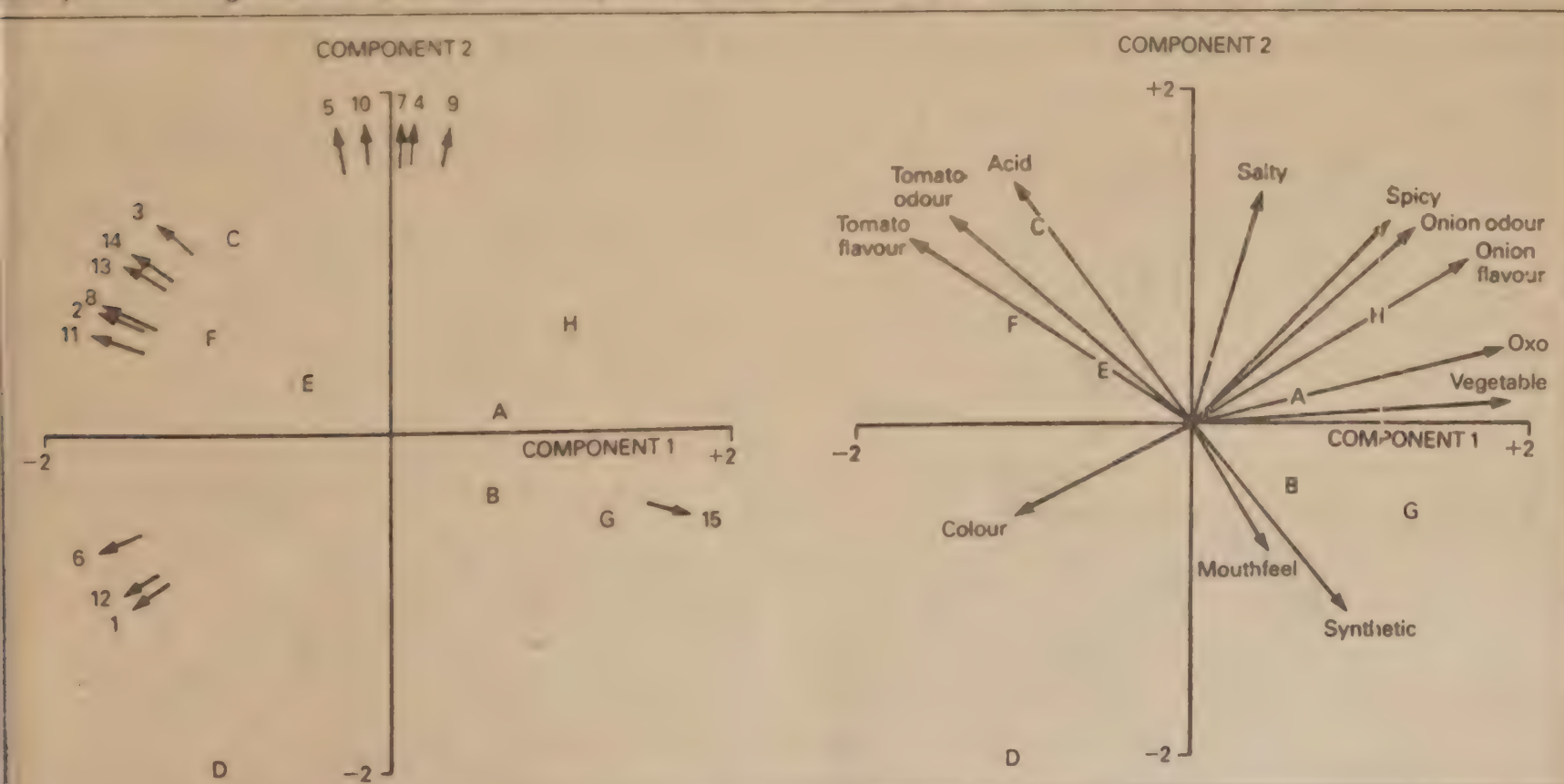
aroma of catfood and the texture of hamburgers. It is well suited to trials of food that has been stored, when it is usually impossible to have a fixed profile beforehand; moreover, it helps overcome the fact that panellists and consumers vary a great deal in the way they describe flavour and odours that develop with storage.

While the food and food-related industries have shown considerable interest in the technique of free choice profiling, a serious impediment to its wider use is the big demand that the Generalised Procrustes method places on computer resources. We have derived a novel algorithm that cuts analysis time by a factor of 1000, and there is now a program written for IBM PC compatible microprocessors that is available commercially.

Meat products

A common error that research workers, product developers and market researchers are prone to make is to assume that a word used in a sensory context, such as 'fatness', is a sensory indicator of a physical constituent such as the fat content of a particular product. In the case of manufactured meat products this is often quite wrong. Careful and detailed correlation analysis is needed of large sets of physical and chemical measurements on the one hand and, on the other, sensory descriptors sampled from a broad range of products.

Left: First two components from a principal components analysis of a sensory profile, from trained panellists, of eight commercial packet tomato soups, A to H. Attributes rated similarly are grouped together and show differentiation between ratings of tomato flavour, other flavours, colour and mouthfeel. Right: Preference vectors for 15 individual panellists superimposed on the sensory space from the diagram on the left. Moving along the direction of a vector represents increasing liking for the samples by that individual. Most of the panellists preferred samples C, F and E, which are high in tomato flavour, but three preferred sample D, which had less flavour but much more colour.



Even then the relations may be only associative and not causal.

The approach derived at our Institute is to extract the main factors of the sensory space, shown by a diagram, and plot the correlated structure of the physical and chemical measurements on this factor space. In a recent study on ham, this graphically revealed the different parts played by total water content and bound water content, as depicted in the photograph.

Relating to consumer preference

Establishing the relationship between eating quality and consumer preference data calls for a model that permits different preference patterns to be detected and incorporated into it. Simple averaging of preference data when there are two opposing views of preference cancels out any significant result. Our Institute has encouraged the use of preference mapping for this task. There are two types of preference mapping, known as internal and external.

Internal preference mapping resolves a series of consumer scores on a given set of samples into a set of preference dimensions that represent the differences among the individual samples, and a set of vectors (one for each consumer) that shows the individual directions of increasing preference. This model is favoured by market-led organisations, and the correlations of sensory attributes given by laboratory panels can be superimposed on to this space.

The power of the technique is shown by a recent study that examined sources of variation in restructured steaks. Internal preference mapping indicated variation in fat and salt content to be the most important determinants of acceptability. However, consumers varied widely in individual pref-

erence, so conventional analysis of the consumer acceptability scores showed no significant difference among the different formulations tested.

External preference mapping uses mathematical techniques known as linear or quadratic regression (modified to take account of the ordinal nature of the preference scores) to express the scores of each consumer in terms of the sensory dimensions defined by the laboratory taste panel. This model is favoured by scientists and food technologists who believe the sensory (or instrumental) space to be a more meaningful representation than that obtained by analysing consumer preferences.

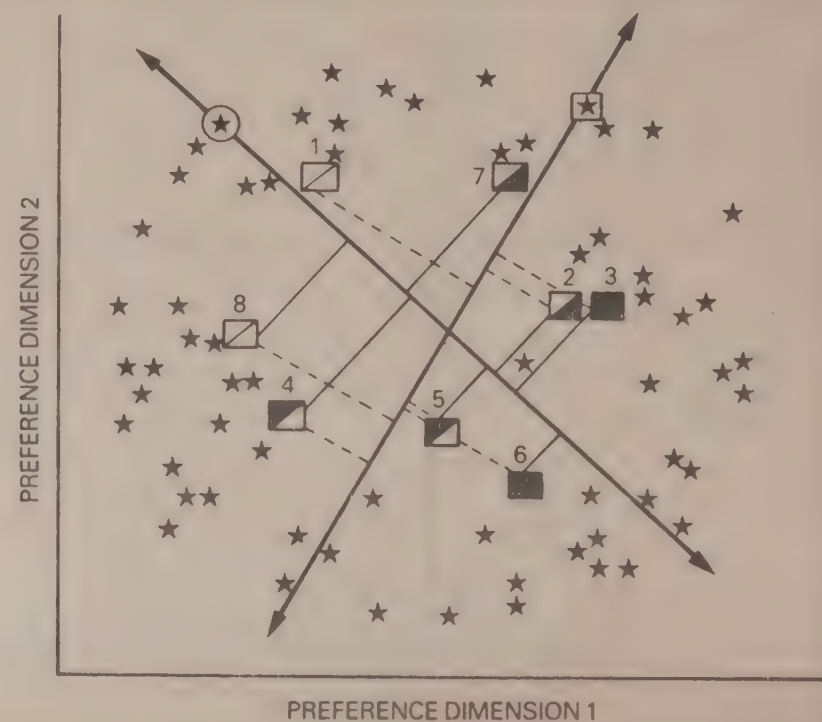
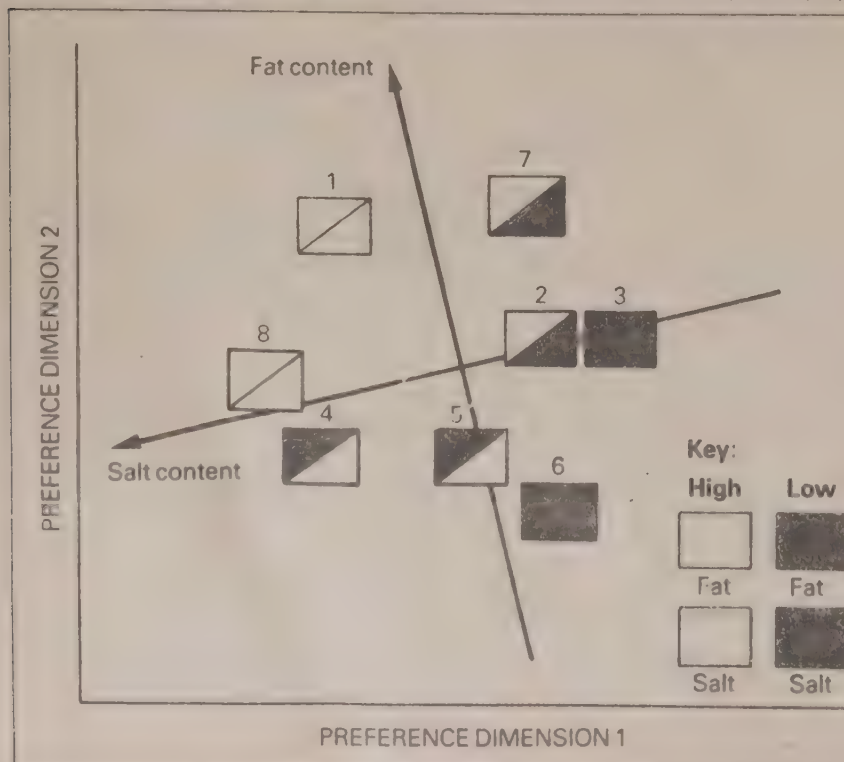
In a recent collaborative study with the Dorset Institute of Higher Education, external preference mapping revealed that consumers divided into two opposing groups: one group preferred fresh chicken, the other preferred conditioned chicken. Another small scale exercise indicated that some panellists based acceptability on flavour but others on co-

The commercial importance of preference mapping arises not just from the amount of information it yields about the formulation of opinion, but also because it proves to be cheap. Algorithms are written in the GENSTAT programming language and an IBM PC version is now being prepared.

Where next

Computer science will continue to change the way that sensory evaluation is carried out. Continuous recording of sensations throughout mastication, or of after-taste perception after swallowing, known as time-intensity measurement, is one probable development. Computer logging of physiological activity in the mouth or even in the brain during eating may also hold the key to explaining individual differences.

Left: Preference map for eight restructured steaks. Right: Here, each star represents scores for one consumer, from which their order of preference can be deduced. For the consumer indicated by a star within a circle, the order of preference is products 1, 8, 7, 4, 5, 2, 3, 6. For the consumer indicated by a star within a square, the order is 7, 3, 2, 1, 5, 6, 8, 4.





Two-dimensional space illustration of the sensory variation in hams. Sensory descriptions are indicated by lower-case lettering. Directions of variation of the physical and chemical measurements are indicated by vectors annotated in capital letters. The variation in total and in bound water content in this space appears to be independent.

the way we perceive food. What we need is miniaturised equipment to measure consumer behaviour accurately but in a manner that is non-intrusive.

The sensory properties of foods are only one of many factors that determine food choice. Research is needed to develop models that integrate such factors into a coherent framework that will enable us to explain why a person selects one food instead of another. We need to elucidate the part that visual cues such as packaging, colour, gloss, surface texture and shape play in assessment of quality.

In the conduct and analysis of sensory trials, there is a need for tests that are simple enough to be done on the factory floor but which are sensitive to small differences that might indicate changes in processing conditions. Techniques for conducting long-term shelf life trials are required. Another area for growth of activity lies in the development of sensory specification criteria that can be used for impartial assessment of the eating quality of products by retailers, gov-

ernment organisations and even by the consumers themselves. Ways to speed up the optimisation of manufactured products are in continuous demand.

At the strategic level there is still a great deal of research to be done on the basic mechanisms of sensory perception. Particular areas of interest to our Institute are the perception of flavour, its masking and its enhancement. In the UK there is a general initiative to understand more about the mastication process and thereby be able to define perceived texture more accurately.

This is an exciting and multidisciplinary area demanding the skills of psychologists, mathematicians, food scientists and flavour chemists, to name but a few. With the creation of a Department of Food Acceptability at our Institute we are now building such a team and hope to make a unique contribution to the understanding of what makes people like some foods and not others.

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Chemical News from Abroad

ENIMONT FIRMS UP SWAPS WITH SNIA AND ORKEM

Enimont and Snia have detailed the terms of their asset swap agreement in the fibres sectors, involving the exchange of six plants. The two companies first signed a letter of intent for the exchange in March 1988.

The total value of the asset swap in terms of turnover amounts to L250bn (\$194.7m). As the exchange is on an equal value basis, no cash payments will be made.

Under the terms of the agreement, Snia will give Enimont its acrylic fibres and polyester fibres assets. These comprise acrylic fibres assets at Villa Cidra and Cesano Maderno, with sales of L180bn, and polyester fibres assets at Naples, with sales of L70bn.

In return, Enimont will give Snia its polyamide fibres assets at Pisticci, with sales of L130bn, its cellulose acetate assets at Vercelli, with sales of L40bn, and its nylon and polyester film and water treatment products activities at Forli and Umbria, with sales of L80bn.

This rationalization step in the Italian fibres sector enables both companies to strengthen their respective leaderships. For Enimont, the world's leading acrylic fibres producer, the exchange will increase its share of the European acrylic fibres market from 31 to 38% and in the polyester fibres market from 13 to 14%. Fibres already account for 9.1% of Enimont's overall sales, and contribute about 6.3% to its overall gross profits.

Snia, on the other hand, will see its share of the European market climb to 50 per cent from 24 per cent currently in nylon cast film, to 75 per cent up from 56 per cent in bioriented nylon film and to 20 per cent up from 16 per cent in polyamide yarn for textile uses.

In acetate yarn from cellulose, where Snia operates with Courtaulds, its market share increases to 50 per cent from 36 per cent.

Meanwhile, despite the restructuring in the French state-owned chemicals industry, Enimont and Orkem have firmed up their asset swap arrangement covering polyethylene/polymethylmethacrylate operations. The contract came into effect on 1 January 1989.

Under the agreement, Enimont has acquired Orkem's low density and linear low density PE production, totalling some 380,000 ton/year and 100,000 ton/year, respectively. In return, Enimont has given Vedril, the company encompassing all its methyl methacrylate activities, to Orkem. Vedril produces 60,000 ton/year methyl methacrylate and 40,000 ton/year polymers at units in Germany and Italy and has a turnover of around FF900m/year (\$152m).

In addition, a joint venture between the two partners is to operate Orkem's 320,000 ton/year Dunkirk cracker, ensuring feedstock for all plant on site, including the PE production transferred to Enimont and the Beaulieu PP installation.

Enimont is setting up a new company in France for the PE production, Societe Francaise de Polyethylene. The new company will take in all R&D, production and sales activity related to the product.

ABB COMPLETES CE PURCHASE

European engineering group Asea Brown Boveri (ABB) has completed its agreed acquisition of US group Combustion Engineering (CE), for \$1.6bn, having purchased to date around 96.7 per cent of the shares currently issued. The acquisition includes CE's petrochemical engineering subsidiary Lummus Crest. "It is very important for ABB to be on the US market, where it

has never been before," an spokesman said. The acquisition makes the US the biggest single country in ABB structure, following by Germany, he added.

Although the US justice department said it would not block the acquisition, its antitrust division is still investigating the possible anticompetitive effect the acquisition could have on the US market for air pollution control equipment.

EC APPROVES ORKEM GRANT

The EC commission has given approval to the FF9.5bn (\$1.6bn) grant the French state made to Orkem between 1985 and 1988 for its restructuring. Originally the commission disputed the grant, equating it with a subsidy, while the French government maintained it was playing the normal role of a shareholder.

Pointing to the considerable effort which it has made over past years to overcome its handicaps, Orkem announced that in 1989 it would yield some FF3bn profits on sales of FF22bn. In comparison to 1988 this represents stable profits on sales up by 8 per cent.

Meanwhile, after its final takeover bid for UK's Coates Bros, Orkem now holds 94.9 per cent of the inks manufacturer's shares, or pledges to sell Orkem, which owned 40.8% of Coates, had launched a bid for the balance in October 1988.

ICL SELL-OFF HITS HURDLE

Israel's Knesset finance committee has rejected the ministry of finance plan for the sale of Israel Chemicals (ICL) by a vote of 21 to 4. It urged the government to reverse its summer 1988 decision to sell a controlling share of ICL to a foreign investor.

Instead, the finance committee is proposing that shares in ICL be sold to workers and to the Israeli public.

ough an offering on the Tel Aviv stock exchange.

"The finance committee views as essential the continued control of Israel chemicals by the government because of the unique character of the company, its size, its control of the country's natural resources, and its importance to the Israeli economy in general and the Negev in particular," said a statement.

However, the committee did not rule out selling part of ICL to private investors at a later stage, but on condition that the government retains a controlling stake in the company.

In theory, the government can disregard the finance committee's recommendation and move ahead with the negotiations. But before any deal can be finalized, it must be brought before the finance committee for approval. Given the committee's recommendation, the government will probably have to reconsider the sale before resuming talks with potential buyers.

NYCOMED WINS CL PHARMA

Norwegian Drugs and power company Hafslund Nycomed has emerged as the successful suitor of CL Pharma, the Austrian pharmaceutical company put up for sale by its owners in August 1988. The purchase price, which will be partly paid in shares of Nycomed, is Sch. 1.6bn (\$132m).

The acquisition of CL Pharma will give Nycomed the capacity of covering the whole of Europe, said a company spokesman. Previously Nycomed has been represented by Schering in German-speaking countries, he added. "Nycomed already has the licensing skills, production capability and financial strength, but CL Pharma has the European marketing network in Austria, Germany and Switzerland and routes to Eastern bloc countries."

range is complementary to Nycomed's strength in diagnostics. It also has promising new products in the antirheumatic and cardiovascular sectors, which will enable Nycomed to achieve its aim of having another side to its pharmaceutical range besides imaging, the spokesman said.

CL Pharma had a turnover of Sch. 2bn and pre-tax profits of Sch. 14m in 1988.

EC AGREES ON CROSS-BORDER MERGER REGULATIONS

Community-wide regulations on cross-border merger controls, which may lead to significant restructuring of companies within the EC, have finally been adopted by the internal market council. The agreement comes after more than 15 years of discussions.

Under the regulation, a merger will be vetted by the commission if the combined turnover of the companies concerned is over Ecu 5bn (\$5.89bn) and the total turnover attained individually within the EC by at least two of the companies concerned is over Ecu 250m, unless each company obtains not more than two thirds of its total turnover in the EC within one member state. Around 40-50 mergers are expected to fall into this area each year.

The Ecu 5bn threshold had been a main stumbling block for the agreement as member states had wanted thresholds varying from Ecu 1-10bn depending on the level of antitrust regulations already in force in the country. In order to suit smaller countries, a member state may still ask the commission to intervene if it has reason to believe free competition in its own territory would be threatened by the move.

After a final discussion, it was decided that national antitrust authorities would not be able to disallow a merger after it had been approved by the commission unless it was in a very iden-

tified market, such as in the fields of national security, media ownership and prudential rules for financial services, a spokesman from DGIV, the competition directorate said.

The regulation is scheduled to come in force in September 1990, but the four year transition period began on the date it was adopted, i.e. 21 December 1989. Companies are required to give prior notification of mergers covered by the controls not longer than a week after signing a protocol agreement. The commission must formally give its approval within three weeks of the notification, or within three months if it decides there is doubt about its compatibility with the common market.

SB CONTINUES DIVESTMENT TRAIL

Smithkline Beecham (SB), the UK/US drugs giant, has continued the divestment of peripheral businesses with agreements to sell its worldwide UHU Adhesives business and its household products operations in the US and Canada. The moves reflect the company's strategy, announced when the merger was formed in 1988, of focusing on the development of its international health-care business.

UHU Adhesives is to be sold for DM269m (\$155m) to a West German consortium, HSG, comprising two industrial investors and Citicorp Venture Capital, together with the present management of UHU. Some DM250m of the purchase price will be paid in cash and the remainder by vendor notes maturing over the next seven years.

UHU, which had a turnover of £43m (\$69.3m) in the year ended 31 March 1989, manufactures and markets a wide range of household adhesives sold in 50 countries worldwide. It was acquired by Beecham in 1970. The household products business is to be sold to West Germany's Benckiser for a total consideration of \$106m, to be paid in cash. Its

In addition, CL Pharma's product

principal products include fabric softeners, detergents and bath additives. Most of the products were acquired in 1977 from Merck and Co. In the year ended 31 March 1989, the business reported sales of \$76.6m in North America. SB also intended to sell its cosmetics business as part of its divestment strategy. It had originally intended to sell it as one entity, but is currently in negotiation to sell the UK and European businesses separately, a spokesman said. These businesses have sales of around £240m/year and £160m/year, respectively. According to observers, the sale of this division may raise £400 m.

PETROFINA SEEKS TIE WITH IPA

Belgian Oil group Petrofina has launched a friendly takeover bid, through its paints subsidiary Sigma Coatings, for France's Industrie des Peintures Associees (IPA). The total offer is valued at round FF318m

(\$55m). IPA, the fourth largest paints producer in France and the last independent one, manufactures and sells its products under the Gauthier and Novemail trade names and posted sales of FF700m in 1988. Sigma is the seventh largest paints producer in Europe and third worldwide in marine paints. Together, Sigma and IPA will produce 200,000 ton/year of paints and post sales of FF3.9m/year, ranking ninth in the world. According to Petrofina, the two companies are "strongly complementary" from a technological, manufacturing and commercial point of view, both internationally and in France.

SANDOZ/SCHERING LINK AGRO UNITS

Responding to the tough agrochemicals business climate, Sandoz and Schering are discussing a possible merger of their respective agrochemical efforts. A 50:50 joint venture company would be a top ten player in the

market with sales topping \$1.5 bn while individually they are unlikely to achieve this status. Last year, Dow and Eli Lilly completed a similar move and the move will allow both firms to cope with the increasing demands on safety, efficacy and environmental impact. Moreover, the two firms would benefit from complementary sales distributions. Sandoz's sales of DM1.4bn (\$798m) in 1988, of which 60% of chemical sales emanate from Western Europe, while Sandoz also has strong positions in the US and Japan. Commentators believe neither Sandoz nor Schering have the necessary critical mass to be a major player in agrochemicals. Moreover, the firms would benefit from combining research, development and production efforts.

R-P SETS UP HUNGARIAN JOINT VENTURE

Rhone-Poulenc's agrochemicals division has signed a 50:50 joint venture with Hungarian chemical company BVK. The agreement will involve formulation and sale in Hungary of French major's Agrochimie plant protection products. Rhone-Poulenc previously sold its products on the Hungarian market through importers but the venture will now enable it to carry out its own marketing. In addition a formulation unit is to be built to complement BVK's existing capacities. It will be used to produce liquid formulations.

ITALY SLOWS UP ON TAX

Montedison is still awaiting Italian government approval for the tax decision favouring its provisions to Enimont. The proposed tax law, which has been under investigation by the EC commission, was due to be passed before the end of 1989. If it failed to meet this deadline it was believed that Montedison would owe about L1.2 trillion (\$938m) in 1989. However, voting has been postponed by the Italian parliament until later. Sources say the delay does not affect Montedison's financial situation and if the law is passed the company will still be exempt from the payment

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Chemical Markets Abroad

ACTIVE STYRENE MARKET CARRIES INTO THE NEW YEAR

Spot styrene prices which showed a violent upsurge just before Christmas, have yet to give any indications of subsiding. In less than a week spot styrene prices rose from \$730/ton cif NWE to \$1 040/ton for T1 product. As players returned from the holiday break the general market perception was that the market had overreacted. Lower nominal numbers of \$920-940/ton cif NWE for T1 were bandied about. But these figures soon gave way to actual deals ranging from \$1040/ton cif Turkey to \$970/ton cif NWE, again for T1 material. Observers generally agree that prices stand at \$1000/ton fob NWE.

The original cause of the jump in styrene prices was shutdowns, first in the US and then in Europe. Market perception moved quickly from belief in a balanced market to one where material was hard to source, especially prompt material.

The 23 day shutdown of Fina's 210,000 ton/year Cosmar unit started market concern, especially when the outage time was extended. Sterling's scheduled shutdown of its 340,000ton/year Texas plant added to fears of a tightening market. Dow Chemical's presence in the market as a major buyer and rumours of difficulties in meeting commitments, confirmed market concern regarding the availability of spot product. US prices rose from 28-29 cent/pound at the beginning of December to stand at approximately 41 cent/pound by the year end. Early indications so far are that higher numbers are attainable. Nominal numbers of 45 cent/pound have been heard in the market, but these have yet to be confirmed.

Future US shutdowns can only exacerbate the current situation. Sterling is planning a full shutdown from late Jan-

uary and is expected to remain down for a month. Fina has also planned a 45 day shutdown of its 272,000 ton/year plant at Cosmar. Observers are saying they would not be surprised to see numbers go even higher in the coming weeks.

In Europe the failure of expected start-ups led to the upswing in price ideas. Although operational Atochem's Gonfreville unit was operating below capacity, while Shell's 300,000 ton/year Moerdijk unit is also thought to have suffered maintenance problems. Several producers are said to have entered the market as buyers, so boosting prices.

Shell Canada's difficulty in meeting its contract negotiations has added a new dimension to styrene. Shell Canada is traditionally a major supplier to the Far East, so if it is unable to meet obligations then potential opportunities will arise. Buyers in Taiwan and Korea have shown reluctance to pay the numbers quoted by European sellers. This could change if derivative producers wish to secure material.

Q1 CONTRACT SETTLEMENTS REACHED

The first batch of quarter one contracts are now beginning to filter through. Players are known to have wished to settle a larger number contracts before the break, however this was not possible.

Benzene has been concluded at DM660/ton for the first quarter, although this represents no change in DM, a weaker dollar makes this a significant increase in the dollar price. Although players appear generally happy with the agreement, it appears that a higher number may have been achieved if spot benzene had not fallen away so drastically at the end of year.

Exxon is believed to have been the market leader in settling the first quarter contracts, with others following. US

January contracts have been concluded at \$1.35/gallon, again Exxon is said to have led the field.

Toluene's TDI grade contract is now settled for quarter one. A figure of DM505/ton was agreed between Bayer and Deutsche Shell. The contract represents a fall of DM10/ton and reflects the current sluggish nature of the toluene market.

Orthoxylene players have finalised contract deals at DM515/ton for the first quarter. The new contract figure shows a loss of DM135/ton on last quarter's agreement. Observers say that the lower first quarter contract is not just a comment on the lacklustre orthoxylene market, but reflects the total malaise afflicting the phthalic anhydride market.

Although the slump in the phthalic anhydride market has been more demand-led than price-led, it is hoped that the lower feedstock prices will help the downstream products stage a recovery. UKW of West Germany is believed to have been the market leader in agreeing a first quarter contract of DM210/ton for methanol. The contract represents a DM50-60/ton rise on fourth quarter numbers. It is generally believed that the new price reflects the recent buoyancy of the methanol market. A number of supply problems has seen the methanol market turnaround in last few months.

US ETHYLENE OXIDE REMAINS STABLE

North American ethylene oxide consumption grew at 5 per cent in 1989, according to Colin A Houston & Associates (CAHA), New York. Demand for ethylene oxide reached 771 000 ton/year last year. While in the US, domestic demand for ethylene oxide derivatives grew at 2 per cent for the same period.

According to the consultant the US ethylene oxide market is suffering

numerous structural changes, triggered by strong world demand for ethylene glycol.

Although the glycol market is set to weaken in 1990, a quick rebound is expected. Exports from the US look set to remain strong. A recent period of tightness saw ethoxylates either reduce capacities or even stop the manufacturing of some products, due to the lack of ethylene oxide. In the short-term the market has returned to balance and few shutdowns are noted.

In the long-term ethoxylators are concerned about securing regular supplies of ethylene oxide. Producers are looking at exclusive joint ventures or relocations nearer ethylene oxide producers.

Texaco and Union Carbide have announced their intention to withdraw from the ethylene oxide merchant market, thereby removing two valuable suppliers. The companies plan to increase their own internal production of fibre grade glycol, intended mainly for the export market. Output in other derivatives such as ethanolamines, surfactants and other derivatives, will also rise.

An agreement between Texaco and Ethyl has altered the balance in the alcohol ethoxylate market. Texaco's level of integration now rivals Shell's. Hoechst, Shell, Texaco and Union Carbide have added some 195 000 ton/year of new capacity in the last year. A further 344 000 ton/year of additional US product plus 299 000 ton/year of Canadian material is expected before 1993. In spite of the large increase in availability, operating rates should remain above 90 per cent in 1995.

Strong demand for PET resins and ethanolamines is being offset by altering demand for antifreeze. Net exports of fibre glycol will grow at over 4 per cent throughout the 1990s. Surfactants account for the largest share of the eth-

ylene oxide merchant market. Ethylene oxide is also used in urethane polyols, flame retardants, choline chloride and ethoxylated starch.

The glycol ether market is experiencing substitution with propylene glycol displacing some ethylene glycol, as concern for the toxicity of the product grows. Approximately 80 per cent of glycol ethers are ethylene based. This is expected to decline to 65 per cent in 1995. Ethylene oxide is also being substituted for propylene oxide, as far as is technically feasible.

COLD HITS US ETHYLENE; NWE CONTRACTS EMERGE

Virtually all the ethylene plants in the US Gulf are closed due to harsh weather conditions. The extreme cold has disabled the heart of the US cracker industry. It has been estimated that up to 300,000 tons of ethylene production has already been lost.

The shutdown does not appear to have had a great effect on prices, as derivative units have also been brought down. With producers' inventories still relatively high, producers do not appear to be overly concerned.

US producers are believed to have curtailed their export activities for the present time, although European suppliers are expected to temporarily fill this gap, despite the number of cracker difficulties experienced at the end of quarter four.

Although no first quarter contracts have been settled, initial nominal numbers appear to be emerging. One major buyer is already believed to have rejected a figure of DM860/ton FD for quarter one. Buyers are thought to be looking at a nominal range of DM830-860/ton FD.

January olefin contracts are all but concluded. Dow has settled its January ethylene contract at DM850/ton, down

from DM860/ton. Its propylene contract has been settled at DM640/ton for January. Shell is thought to have settled some ethylene contracts in the range DM850.50/ton, against DM850/ton in December. But Shell's January contracts are subject to confirmation.

The first quarter negotiation's speed in getting underway contrasts sharply with quarter four olefin settlements which were only finalised at the end of the year. These saw ethylene contracts fixed within the relatively narrow range of DM925-950/ton FD. Profound differences between players' views of the propylene market, determined a sluggish rate of settlements, leaving some contracts still under renegotiation in the run-up to Christmas.

Early propylene contracts concluded at DM750/ton FD found themselves reopened for discussion as the spot price plummeted in the second half of October. This was due to pressure from decreased sea availability and, in at least one instance, unplanned shortfalls in derivative demand, presenting monomer sellers with a "long" propylene fix. The highest surviving numbers at the end of 1989 - of DM725/ton — were under renegotiation in the first part of January and are expected to give way to lower numbers.

Huls, having purchased early on from Veba and DSM at DM750/ton, obtained fresh offers at DM725/ton FD. Amoco's DM750/ton FD contracts, revised downwards to a provisional DM725/ton FD, did not stabilise for long before coming once again under pressure.

To reflect the rapidly falling propylene price, several major buyers attempted to negotiate combined Q4 1989 and Q1 1990 prices. BASF consistently held out for DM6560/ton for Q4, linking it to an identical number for Q1 to obtain a single average over six months. It concluded on this basis with DSM, and may have done likewise for much larger volumes.

DSM on its part concluded at DM650/ton for combined Q4 and Q1 with Solvay as well as BASF, and is believed to have sealed agreements along the same lines with its other major customers.

An explanation offered by the market for the DM650/ton combined quarter settlements is that, from the producers' viewpoint, it may represent the lesser evil, a kind of "insurance policy" against an expected, and as yet uncertain, further slip for propylene over the coming quarter.

The DM650/ton combined price was, however, criticised by some for failing to reflect the "pulse" of the market over time.

Himont concluded a limited number of important contracts for the fourth quarter at DM650/ton. The settlements were not tied to the first quarter, for which the company had not yet committed itself.

BRAZIL DEBATES METHANOL USE

The Debacle surrounding Brazil's use of methanol seems no nearer conclusion. On 7 December last year a federal court in Rio de Janeiro backed environmental groups and, on the basis of its toxicity, imposed a nationwide ban on the use of methanol.

Since then the government has been collecting data on the product's toxicity in order to have the ban over-turned.

Because methanol was to be used as a major gasoline component to combat fuel shortages, Brazil's minister of mining and energy has claimed that a ban will cause the country's major cities to grind to a halt.

The Sao Paulo State Environmental Agency (Cetesb) claims that, if added the right proportions and used only in alcohol powered cars, methanol in fuel

is harmless.

Brazil's acute shortage of fuel has focussed attention on methanol, especially imported product. A poor sugar crop, coupled with strong demand from other sectors, has left Brazil short of ethanol, which is used extensively as vehicle gasoline.

GROWTH IN SPAIN

Spain's chemical industry achieved a 9 per cent increase in production with a 9.5 per cent increase in consumption in 1988, according to figures released by the Spanish Ministry of Industry and Energy. Capacity utilization increased to 91.5 per cent compared with 87 per cent in 1987.

The greatest production increases were achieved by the pharmaceuticals and plastics sectors, each of which saw a 12.9 per cent rise. In the plastics sector however, rubber was weaker in terms of

production and demand, despite synthetic rubber exports reaching record levels.

Exports of SBR and PB rose by 147 per cent over the 1987 level to reach 36,900 ton, offsetting a large decline in domestic demand and increasing imports. Domestic SBR and PB consumption dropped 10 per cent to 98,500 ton. However, imports grew by 12 per cent to reach 72,800 ton.

Total domestic rubber demand fell 3.9 per cent to 240,500 ton in 1988, with demand for all grades of synthetic rubber falling 8 per cent to 138,300 ton, natural rubber demand increased 2.9 per cent to 102,200 ton.

Total rubber imports increased 5.5 per cent over 1987 to reach 217,100 ton with the major proportion being synthetic rubber up 7 per cent at 113,500 ton while natural rubber imports rose 3.8 per cent to 103,600 ton.

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Environment

UK UNVEILS FRAMEWORK FOR ENVIRONMENTAL PROTECTION

The UK's long-awaited environmental protection, or "green" bill was announced by the government just days before the Christmas recess. The weighty document contains the widest ranging environmental legislation ever seen in the UK and arguably the most stringent in the world. It introduces to the UK the concept of integrated pollution control, which will apply to all processes which have scheduled air emissions, discharge "red list" substances or produced significant quantities of special waste.

The approach will use standards derived from BATNEEC (Best Available Technology Not Entailing Excessive Cost) to reduce waste generation and to control the effect on the environment. All environmental quality objectives will have to be met.

The approach will apply immediately to new plant and be applied over a period of time to existing installations. An authorization will be required which will be open to public scrutiny, with registers giving details of the operation and whether standards are being met. The UK's Chemical Industries Association

has described the broad objectives of the approach as "laudable".

"They are entirely consistent with the commitment of the chemical industry, as set out in its Responsible Care Programme, to improve performance in key areas of public concern" it says.

The bill also reforms current waste disposal law, conferring enhanced responsibility on waste producers, and tightens controls on the importation and exportation of toxic waste and use of genetically engineering organism. There are also measures to prevent dumping at sea outside the UK's territorial waters. Penalties for incineration at sea without a licence rise from £2,000 (\$3,226) to a maximum of £50,000.

Welcoming the bill in principle, John Cox, director general of the UK's Chemical Industries Association, said it "set out to make a positive and effective contribution to environmental protection and improvement." Association executives are now examining the fine print of the bill, before giving a detailed response.

The CIA says it had become increasingly concerned that the present fragmented system of controls in the UK was not sufficiently responsive to current needs and has for some years urged

the government to make improvements in the areas of policy development and enforcement of legislation.

GERMAN MAJORS FORM RECYCLING JV

West Germany's three major plastic producers, BASF, Hoechst and Bayer are collaborating in a joint venture plastics waste separation and recycling operation. According to BASF, the operation will be capable of handling some 15,000 ton/year of waste and will cost some DM50m (\$30m).

The three companies intend to set up a demonstration plant in a large German city, to be operational later this year. This will process a full range of domestic waste, separating out plastics, recycling these into usable form, and ultimately incinerating material at the end of its useful life.

The move is seen as a response to forthcoming EC legislation on waste and especially the plastics components. The proposed Directive is known to favour recycling and, it is thought, will set targets for a minimal amount of disposal by incineration, around 15-20 per cent. Incineration is the method so far favoured by plastics industry bodies such as the UK's BPF, Germany's VKI and Europe's APME. These point to the high thermal value of plastics waste.

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which can be utilised in domestic waste incineration.

CIA LAUNCHES CLEAN-UP INSURANCE

The UK Chemical Industries Association has arranged environmental impairment liability insurance for its members. Unlike most existing similar insurances, the new facility provides cover for pollution occurring over a period of time instead of sudden accidental pollution.

The move comes in the face of a draft EC directive on civil liability for waste currently in preparation and which will result in broader liability for environmental damage. In the US, there have already been several cases of disputes between companies and their insurers for gradual pollution, where clean-up costs have run into billions of dollars.

The insurance is restricted to sites located in the UK and Europe. To obtain cover, the member company must have an independent environmental survey carried out for the site in question. Several exclusions are stipulated including claims arising from genetic manipulation activities, from waste sites, from transportation or from non-compliance with regulations.

EC DRAWS UP CAR EXHAUST DIRECTIVE

A draft directive for more effective limitations on car exhaust pollutants has been drawn up by the European Commission. Environmental commissioner Carlo Ripa di Meana said the proposals were particularly important since they completed efforts for introducing stricter norms which would "guarantee effective environmental protection in response to growing demands of public opinion."

The new proposal is the end result of a promise made by the Commission to the Council last June when the Coun-

cil agreed on the emission levels for the vehicles of less than 1.4 litre. Major measures are:

An alignment for vehicles of larger capacities along the norms and by the dates set out in Directive EEC/89/458 based on an improved European trial procedure designed to reflect typical driving conditions:

The incorporation into this procedure of emission values already fixed by the Council for small cylinder cars so that Europeans are as strict as those in the US:

To agree on norms to be applied uniformly to all capacities and to both gasoline and diesel engines. Norms for diesel engines which are stricter on particle emissions than Directive EEC/88/436 sets out: and

The introduction, in accordance with Commission promises made in June 1985, of supplementary requirements on the durability of monitoring devices.

HOECHST AWAITS BURNER RULING

Following a six-day public hearing, Hoechst is now awaiting a decision by the Hesse state authorities on its plans to build a new 60,000 ton/year toxic waste incineration facility at Frankfurt. The district administrator's office has hinted this is unlikely to come before 1990.

Under West German emission control statutes, the authorities were required to hear complaints filed by 2,500 residents living close to the planned facility. Opponents say they will file suit against any state decision in favour of the plant.

As this could force a delay, even if only temporarily, Hoechst does not now expect the new facility to be completed on schedule in 1991. The company has therefore said it will consider applying for permission to continue to operate an existing 40-45,000 ton/year incinerator

beyond the 1990 cut-off date.

The new plant is set to be built at a cost of DM135m. (\$73m) by MAN Gutehoffnungshutte, using rotary furnace technology and wet scrubbing. Hoechst proposes to burn 59,000 ton/year of production residues from its Frankfurt complex, 30,000 ton/year of wastes from other plants in the Rhine-Main area, and 3,200 ton/year of residues from plants at other West German locations. Incineration will produce 8,000 ton/year of salt residues, which Hoechst plans to discharge into the river Main.

CEFIC RESPONDS TO MOUNTING PVC LOBBY

In response to the mounting environmental lobby against chlorine and chlorine-containing compounds, Cefic, the European federation of chemical industries associations, is setting up a policy group to address the problem for the long-term. Manufacturers and users will be involved.

Cefic is concerned about what it sees as "emotional reaction": some 55-60 per cent of the chemical industry would grind to a halt if chlorine and chlorine-containing compounds were restricted, a spokesman claimed recently.

The new group will study the ecological effects of chlorinated compounds, assess the hazards and evaluate the risks. It will look at risk management and the possible restriction or withdrawal of some compounds from certain uses. Other actions by the group could include an outreach-type programme providing information to the public.

Cefic envisages future restrictions on the marketing of certain products containing chlorine. But consumer action, it believes, will be more forceful than regulation. On PVC bottles, the target of many environmentalists, Cefic believes the answer lies in waste management.

News from America

SHELL FORESEES OVERCAPACITY IN EUROPEAN ETHYLENE

Shell International Chemical sees signs of impending ethylene overcapacity in Europe. According to a Shell spokesman capacity creep provides the potential for an extra 4%. 5% of capacity in other words on extra 2 million m.t./year of ethylene by 1989. The company fears operating rates could fall to 85% in the early 1990s.

For the first time since March 1986, production of ethylene in Europe has been substantially lower than available capacity. In September last, ethylene production was at 13.6 million m.t./year against available capacity of 14.3 million m.t./year.

Technical limits are slightly above 15.5 million m.t./year, a figure reached when ethylene capacity peaked at this level in February 1989.

Since then, several units that had been closed for maintenance were re-started. The result is significant creep that has boosted available capacity in Europe to 15.2 million m.t./year.

De-bottlenecking potential is sufficient to cope with demand. Shell is considering major debottlenecking at its Mossmorran, U.K., ethylene plant — a joint venture with Exxon — and is studying plans for a new unit at its Moerdijk site in the Netherlands, although this now looks doubtful.

ICI has found it non-feasible to re-open its ethylene unit at its Wilton site. Dow-Europe has postponed plans for a cracker at Terneuzen, the Netherlands. However, new crackers will be built by En-Mont at Brindisi, Italy and by West Germany's Veba. BP Chemicals on track with a huge expansion at Grangemouth, U.K. and Repsol is proposing a new grass-roots unit in Spain. BASF announced in September, its firm plans

to go ahead with a brand new ethylene plant at Antwerp, the prime motive for building the new plant is to secure a captive propylene supply.

As regards polyethylene, Shell claims PE demand in continental Europe is booming.

Stocks which peaked in spring 1989 at 470,000 m.t./month, were back down to about 350,000 m.t. in September and margins have turned up.

In polypropylene inventories of about 500,000 m.t./month are twice what they should be, and production curves are climbing steeply, despite efforts by producers to keep output in check. Himont, the largest producer, was running at 50% capacity.

Shell's PP demand growth projections are quite optimistic, at about 10%/year. Because of its strong feedstock backup, Shell is able to maintain a large position in the commodity grades of polypropylene. However the company is in for a 50/50 split between commodity and specialty polymer grades for the future.

The impact of a decline in prices for polyethylene and polypropylene has been clearly seen in Shell's third-quarter results.

Chemical earnings fell dramatically to \$308 million, from \$494 million in the year-earlier period.

The squeeze on polyethylene was also reflected in third-quarter results from BP Chemicals, where profits fell from \$20.5 million to \$17.7 million.

US CHEMICAL INDUSTRY UPSET OVER CLEAN AIR ACT

The chemical industry is baulking at stiff new enforcement and permit provisions in the Clean Air Act amendments proposed by the U.S. President

Bush. The fines mandate upto 15 years in jail and fines of \$250,000 per individual or \$500,000 per organization knowing release of any listed hazardous air pollutant that places people in imminent danger of death or bodily injury. The proposal includes a bounty hunter provision that awards \$19,000 to anyone who provides information that leads to a criminal conviction or a civil, judicial or administrative judgement of liability.

Under current law, the Clean Air Act provides criminal sanctions if someone actively lies to the agency or fabricates records. The President's bill would make a felony of knowing failure to act including the submission of an incomplete permit or failure to keep certain non-required records, according to Chemical Industry spokesman. For example if a plant manager leaves information out of a permit application because he does not believe EPA wants or needs the material EPA can later decide it was material to its interests and bring a criminal case.

But an EPA spokeswoman maintains that the chemical industry has unduly focussed on the criminal provisions in the legislation. When hazardous air pollutants are listed, the agency will also release risk assessments of the degree of hazard each substance poses. That will give industry enough information to determine and maintain a safe level of emissions while EPA develops standards EPA will not bring an enforcement unless there is evidence of recalcitrance. Firms that try to comply with the law using standard operating procedures will not be penalised, she added.

The air pollution permit system which EPA wants to streamline is another source of concern for the Chemical Industry. The bill proposes a 'one-stop shop' for all permits, whether they relate to acid rain, air toxic or ozone controls. States will require a processing fee from industry of \$25 for each ton of a pollutant emitted annually.

News from Japan

JAPAN TO FOLLOW WEST IN BUILDING UP HUMAN-GENOME DATA BASE

While research activities are being stepped up in many countries of the world to elucidate the human genetic codes, Japan is likely to follow the U.S. and the U.K. in building up by around 1993 a data base for mapping the human genes. Japanese researchers of the private academic and government sectors tackling the analysis of, the insight into, the human genome will work together, as a first step, to work out a plan to implement the project. Genome is one complete haploid set of chromosomes of an organism.

In the U.S. Yale University has begun offering services involving the use of its human-genome data base called "HGML" (human gene mapping library), which — aided by a large IBM computer — can be accessed through telephone lines by users everywhere in the world. The U.K. is also preparing to launch similar services as from 1991. It is thought the Japanese to be involved in the project will produce a data base to be connected with other equivalent DNA libraries and their users throughout the world.

This move is in line with the on-going progress in Japan and research activities related to the human genome; a project related to this theme advocated by the Ministry of Education will begin bearing fruit in 1991 and Institute of Physical and Chemical Research will also finish a project related to development of a DNA-base sequencing system in the same year. It is believed that these results will be of great help for the Japanese to produce a data base to be used for mapping the human genes.

This is part of international efforts aimed at ultimately determining all the DNA-base sequences of the human genes and in putting them into a data

base accessible to anyone any-where in the world wanting the gene information.

Human DNA is composed of about 3 billion base pairs, which it is presumed, contain 50-100,000 genes. Of them, about 1,600 genes have so far been charted to gene maps, plus about 3,300 DNA fractions arranged on them.

SUMITOMO CHEMICAL SETS UP FIRM TO COMMERCIALIZE HYGIENIC GOODS

Sumitomo Chemical Co. started early in December Sumika Life-Tech Co., a wholly owned subsidiary for planning/development and sales of hygienic products.

The new company will market, as a first step, six items — most of them are pyrethroid insecticides for household use already developed by Sumitomo Chemical.

Sumika Life-Tech intends to develop and commercialize new hygiene-related products that will not enter into rivalry with existing products manufactured by other companies. The company can utilize a variety of the parent firm's formulating technologies for pyrethroid-based insecticidal compounds and other related chemicals.

Sumitomo Chemical has been supplying 11 technical-grade pyrethroid compounds exclusively for household-use products and 15 others including those for farm chemicals. The company believes it is possible to develop newer products not available on the market on the basis of these compounds and its techniques related to slow release and microcapsulization of ingredients.

MITSUBISHI KASEI TO STEP UP OVERSEAS CLINICAL TESTS ON DRUGS

Mitsubishi Kasei Corp. plans to inaugurate this year full-fledged clinical tests

on drugs in the United States and Europe. To this end, the company is scheduled to open this year two liaison offices — one each in Britain and the States: they will serve as footholds for the plane clinical trials.

The British office will be staffed with a medical doctor and a few experts. Data obtained from clinical tests in the U.K. will also be available in the States, thereby improving the efficiency of R & D work.

The company already has several business footholds in the States and intends to select a site for the American liaison office taking into consideration the footholds' locations.

In West Germany, it has completed phase-I clinical tests on a self-developed cardiogenic. Phase-II tests for the product will be conducted by the planned British liaison office since West Germany is moving toward drastically curtailing medical expenses and, therefore, seems unsuitable for location of a foothold for pharmaceutical operations.

Mitsubishi Kasei regards pharmaceutical operations as one of the main pillars for its future business operations.

It has tied up with Nikken Chemicals and Tokyo Tanabe with regard to drug business. Mitsubishi's drug sales in the current fiscal year are projected to reach ¥30 billion.

In a bid to further build up drug operations, the company envisages promoting team-ups with U.S. and European enterprises. It has already established a joint-venture company with Synthelabo Pharmacie (France) and licensed Bayer (W.Germany) and Genentech (U.S.) to produce a cure for asthma and an anti-thrombotic agent respectively.

The two products have been developed by the Japanese company and are now being clinically tested by the two latter overseas companies.

MITSUBISHI TO INTRODUCE UCC PROCESS FOR PP PRODUCTION

Mitsubishi Petrochemical Co., has signed contracts with Union Carbide Chemical & Plastic Co. (Conneticut, U.S.) — Union Carbide Corp.'s subsidiary — with regard to introducing the Unipol process for polypropylene (PP) product from the UCC subsidiary and licensing Union Carbide Corp. to use — on an optional basis — high-activity PP catalysts developed by the Japanese company itself. The process concerned has been jointly developed by the UCC subsidiary and Shell Chemical (U.S.).

Mitsubishi Petrochemical — together with Mitsubishi Kasei and Dia Polymer (50/50 joint venture between Mitsubishi Petrochemical and Mitsubishi Kasei) — is scheduled to build an 80,000-t/y PP plant in Kashima (Ibaraki Prefecture) with completion scheduled for 1992 and has already informed MITI of the PP project. The Unipol process will be employed for the planned new plant.

Mitsubishi Petrochemical envisages developing new-grade PP suitable for the Japanese market by utilizing the inhouse-developed high-activity PP catalysts for the Unipol process.

When the planned PP plant is started up, Mitsubishi Petrochemical plans to suspend operation of its 50,000-t/y PP plant now in operation.

CFC SUBSTITUTES SEEN BEING PRODUCED USING NEW PLANT

Du Pont-Mitsui Fluorochemicals Co. has almost reached a decision on building production facilities for two types of chlorofluorocarbon (CFC) at its Chiba factory with completion scheduled for 1993 or 1994. They are HFC-134a and HCFC-123, substitutes for CFC-12 (refrigerant) and CFC-11 (blowing agent), respectively. This move responds to the legal regulations

for specified CFCs which went into force last July.

Du Pont — a U.S. chemical giant — is building a commercial plant for the two CFC substitutes with completion scheduled for this November thru December. The date for start-up of construction of the planned production facilities will be settled taking into account the operation of Du Pont's plant now under construction and the program for curtailing production/consumption of specified CFCs.

Keeping pace with Du Pont's worldwide CFC operations, DU Pont-Mitsui Fluorochemicals plans to push ahead with commercialization of CFC substitutes. The company intends to import from the U.S. company substitutes for CFCs which are in comparatively small demand in Japan. It is scheduled to domestically produce those for CFCs enjoying large demand here.

With regard to CFC-113, Du Pont-Mitsui fluorochemicals is considering supplying Japanese users with its substitute developed by the U.S. company.

TOHO TITANIUM TO EXPAND PRODUCTION CAPACITY FOR TITANIUM SPONGE

Toho Titanium Company, Ltd. will raise the production capacity for titanium sponge from 690 t/m to 750 t/m at its Chigasaki factory (Kanagawa Prefecture). As a result, its titanium-sponge production in the latter half of fiscal 1989 will register about 4,500 tons and production throughout 1989 is expected to reach about 8,500 tons.

Titanium sponge is mainly used for airplane parts and structural materials for chemical plants. Since demand for aircraft in Europe and America is now brisk, titanium sponge supplies tend to be tight.

Toho Titanium is the 2nd-largest

titanium-sponge manufacturer at Osaka Titanium Co. The company mainly delivering the product to Nippon Mining Co. and Nippon Steel Corporation. Neither company has a large vacuum fusion furnace, so Toho Titanium often delivers titanium sponge in the form of ingot.

According to Toho Titanium, its titanium-sponge inventory at the end of September was about 650 tons, about half the volume in the same period of the previous year. The production increase to be made this time stems from the rise in world-wide titanium sponge demand. Consequently, domestic production is likely to be larger than ever. The titanium sponge price rose about 5% in the April-September period of last year but the tendency for the price to increase is no longer seen. Toho Titanium aims at increasing profits by boosting sales and intends to resume dividend payments with the March 1991-term (April, 1990-March, 1991) settlement of accounts.

TOYO JOZO PLANNING JOINT DRUG PRODUCTION IN FRANCE

Toyo Jozo Co. is considering setting up a joint venture in France this year for synthesis and formulation of drugs. The possible partners are Pierre Fable S.A. of France and/or ISF of Italy.

The Japanese company has provided the French firm with its manufacturing technology for "Ricamycin" macrolide antibiotic and the Italian firm with that for "Elcitonin" antiosteoporosis agent. The new joint firm, if set up, will manufacture the two drugs for the EC market. It will be Toyo Jozo's first production base for human-use drugs in Europe. Negotiations are now under way on the establishment of the joint firm with the two European companies.

Elcitonin has been produced and marketed in Italy and Spain with its sales in Italy reaching ¥14 billion a year, the 2nd-largest sales figure next to

¥20billion attained in Japan. Withklein-group companies to which Toyo Jozo has granted Elcitonin technology are also likely to obtain manufacturing approval for it in the U.K., Benelux countries, Greece, Brazil, New Zealand and Australia in the near future. Elcitonin available as a nasal drop is expected to enjoy great demand in Europe in view of its prominent advantages and Europeans' inclination toward nasal drops rather than shots. Camycin is also likely to be granted manufacturing approval in France and Italy by the end of this summer.

Toyo Jozo is operating two subsidiaries in West Europe, one each in Switzerland and Spain, for information collection and clinical testing, and supply of animal-use antibiotics, respectively.

TOKUYAMA SODA GRANTS AIN LICENSE TO DOW CHEMICAL

Tokuyama Soda Co., Ltd. and The Dow Chemical Company (U.S.A.) recently inked a non-exclusive agreement licensing Dow Chemical to produce high-purity aluminum nitride (AIN) in the United States using Tokuyama's patented process. The move, an essential part of Tokuyama's global AIN business strategy and the first with a non-Japanese company, follows a similar agreement struck domestically with Tokyo Aluminum K.K. in May 1989.

The pact gives Dow Chemical comprehensive rights to Tokuyama's high-purity AIN powder and translucent AIN ceramic substances in addition to their respective manufacturing processes. It will enable Dow to produce and market AIN powder in the U.S. and also permit Dow's customers to manufacture and sell translucent AIN ceramic products.

Aluminum nitride ceramics boast of thermal conductivity three-times higher than alumina but are traditionally an opaque, blackish-gray color and difficult to sinter. Tokuyama Soda took up

these problems ten years ago and synthesized an AIN powder with sharp particle distribution and enhanced sinterability, and scored an industry first by sintering translucent AIN ceramics under atmospheric pressure. The company claims its products have ten-times better thermal conductivity than alumina and are suitable for sintering into sheet fairings and laminated goods.

Tokuyama Soda constructed plant facilities in May 1985 capable of producing 10 tons of AIN powder per year. The company subsequently expanded annual capacity to 130 tons in early 1989 to meet rising demand from domestic and overseas ceramic and electrical machinery makers, and to further extend its business development in the U.S. and Europe.

Tokuyama Soda has established patents covering its highgrade AIN in the U.S., Canada, the U.K., West Germany, Taiwan and South Korea.

SHISEIDO TO SELL PRODUCTS IN SPAIN VIA LOCAL FIRM

Shiseido Company, Japan's top cosmetic maker, has announced that it has signed a contract with Invesgen S.A. to sell its products via the Spanish drug manufacturer's sales network. Under the agreement, Shiseido brand cosmetics will be sold at 20 department stores and 170 retail shops in Spain run by the Induyco Group, the major Spanish business group to which Invesgen belongs, Shiseido said. Annual sales are targeted at ¥200 million for the initial year starting next autumn and at ¥1 billion within five years.

Shiseido says it decided on the business in light of the strong demand expected in the Spanish cosmetics market, which has been growing rapidly ahead of the Barcelona Olympic Games scheduled for 1992. Shiseido expects the business linkage to serve as a step toward entering other Spanish-language markets abroad, such as Latin America.

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New Developments from Japan

HIGH-ELASTICITY POLYESTER FIBER PIONEERED: TEIJIN

Teijin Ltd. has developed elastic polyester fiber (trade name: Rexe) by spinning polyester/ester polymer. The breaking extension of the new product is higher than 600% as in the case with elastic polyurethane fiber but the former is superior to the latter in resistance against moisture, heat and alkali.

The company plans to commercialise tricot by combining the new product with high-strength polyester fiber. The tricot will be applied to sports-wear as a first step. It will also be used in the form of lingerie and foundation garments sometime in the future.

The new fiber's cross section has the shape of cinquefoil. The company envisages starting commercial production of 40-300 denier fiber this October. Monthly production will be scaled up to 25 tons two years hence and to about 100 tons five to six years hence.

Spandex (polyurethane) is the dominant type of high-elasticity fiber. It is usually combined with nylon fiber and is extensively used in ladies' wear (underwear and stockings, etc.) and sportswear (ski/swim wear, etc.). The company intends to thrust into the elastic-fiber market by capitalising on the new product.

RODENTICIDE APPLIED TO SHEATH FOR ELECTRIC CABLE

Mitsubishi Cable Industries Ltd. has developed rat-repellent electric cables covered with a plastic (polyvinyl chloride) sheath containing microcapsules of cycloheximide used as a rodenticide. The cycloheximide microcapsules are being produced by Tanabe Seiyaku Co.

Mitsubishi has supplied the new products to Kanazawa Railway Station located in the north of Kyoto: they are

78km long in total and have been used for transmission of high-voltage electric power and communications. This is the first time plastic-sheathed rat-repellent electric cables have been used in large quantities for commercial purposes.

The company claims that the new product will be usable for a long time (20 to 30 years). Electric cables for which high-level safety is required have hitherto often been covered with metallic tape for the purpose of preventing damage from rats. Plastic-sheathed cables have been applied only in limited areas.

Mitsubishi has pioneered the new product by employing the said microcapsules and improving the properties (water resistance, etc.) of polyvinyl chloride. It envisages applying the new product computers and OA equipment whose electric cables are often gnawed by rats.

ALUMINIUM REINFORCED WITH CARBON FIBER, CERAMIC WHISKERS

Osaka Gas Co. and Hitachi Zosen Co. have jointly developed aluminium reinforced with composite of coal pitch-based carbon fiber and ceramic whiskers. The new product is superior to carbon fiber-reinforced aluminium in abrasion resistance, vibration-damping properties and machinability.

It can be produced at lower cost than is the case with silicon-carbide whisker-applied composite material. Its potential applications are sliding parts for internal-combustion engines and bearing material.

The two companies uniformly combined isotropic pitch-based carbon fiber with ceramic whiskers and impregnated the resultant preform with aluminium. Hitachi Zosen molded the impregnated preform into machinery parts using a

high-pressure casting process. The rings test-manufactured from the form require no lubricants including grease.

Since the new product contains ceramic whiskers, it can easily be molded into targeted products. In addition, the product requires no surface treatment since it incorporates pitch-based carbon fiber. Moldings obtained from the new product have abrasion resistance 10 times that of aluminium employed as matrix. Their vibration-damping properties are equal to that of cast iron. They have only a small thermal coefficient of expansion and can easily be processed by means of ordinary ultrahard tools.

Cost of the abovementioned ceramic whiskers is one-tenth that of silicon-carbide whiskers and the pitch-based carbon fiber contained in the new product is roughly 1mm in length and 10 microns in diameter. The two companies plan to supply the product in sample form to makers of hydraulic and pneumatic pistons and cylinder tubes.

SEMICONDUCTOR PRODUCTION PLANNED FOR WEST GERMANY

Mitsubishi Electric Corp. has announced its plan for through production of semiconductors in Germany. The company is scheduled to establish Mitsubishi Semiconductor Europe GmbH in Alsdorf, W. Germany. The new subsidiary will begin at the end of 1991 to produce LSIs including 4M-DRAM chips using 0.8-micron processing technology and scale up treatment capacity for silicon wafers to 375 pieces a day by 1994.

The planned capacity build-up will lead to monthly production of 2.4-3 million pieces of 1M/4M-DRAM chips, 16-bit 1-chip microcomputers, 32-bit CPUs and ASICs. The sales value concerned will then reach about ¥42 billion.

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NEW PRODUCTS

ANTIMICROBIAL FOAM INSOLE

Foam Products Corporation has developed this new Air Fresh Foam which incorporates Intersept, a highly effective antimicrobial airfresh foam insoles containing Intersept as of the most significant advances in foot wear manufacturing according to Foam Products. They help reduce shoe odour and preserve hygienic freshness. They inhibit the formation of bacterial growth, thus controlling the odour at source. The antimicrobial feature and Intersept is long lasting because it is incorporated throughout the foam insole rather than just applied to the surface. This creates a reservoir of Intersept that continues to protect the foam insole from odour causing bacteria.

SOLVENT OIL

Reilly-Whiteman has introduced a new fatliquor, showing excellent results in all major trials. Solvol 60 solvent oil when applied alone to full grain leathers or splits results in exceptional softness and good light stability. A combination of stasoft 2 mixed with Solvol 60 gives an unusually rich and full leathers. Solvol 60 is a mixture of sulphated marine oils combined with solvents and other petroleum distillates. The result is a 60% active fatliquor with a combined SO_2 of about 1.8-2.0 and a pH of a 10% solution of approximately 7.0. *Leather*, 191 (4571), 1989.

FROM BASF

Densodrin OF from BASF imparts high water resistance,

good softness and a pleasing handle to leathers and for skins. It is used in combination with Densodrin E or GF in aqueous floats. Fixing with metallic salts is no longer necessary. It can also be diluted with small proportions of water-miscible solvents or water and applied to finished leathers by any conventional method to improve the handle or water resistance.

Relugan RV, also from BASF is a water soluble light fast retanning agent that has a very strong filling effect and does not yellow on exposure to elevated temperature. Used in the retannage it lightens the grain, reduces stretch and imparts a more compact handle to leather. It is particularly suitable for retanning spongy rawstock as well as sheep and goat skins. *Leather*, 191, (4571), 1989.

ECO FRIENDLY PRESERVATIVE

Mergal KM270 from Riedel-de-Haen of Seelze West Germany is an optimised combination of the properties of the active ingredients which meet all the demands made of a leather preservative. It has a broad range of activity against bacteria, yeasts and mould and when used a concentration of 0.05-0.15% is enough for preservation of pickled pelts and wet blues. It has only a weak glycolic odour. The toxicity is low and the oral $\text{LD}_{50} = 2600 \text{ mg/kg rat}$. It forms the emulsion in water which is straightward to use in tanning. It is stable in media ranging from acidic to weakly alkaline. The aqueous predilution should not be left to stand because the active substances may precipitate. The spent liquor contains virtually no fungicidal residues and the biological treatment of the waste water will not be adversely affected. *Leather*, 191, (4571), 1989.

LEATHER ABSTRACTS

Systematic structure-property relationships in polymeric coatings. R.D. Deanin, *J. Am. Leath. Chem. Assoc.*, **84**, 237, 1989.

The relationships between polymer structure, practical properties and performance in coatings are best organised in terms of structural features from smallest to largest; sub-molecular, molecular, intermolecular, and supermolecular. Greatest recent progress has been in supermolecular structure, particularly reinforced components, polymer blends, foams and multicomponent macro structures.

Effects of hydrophilic-hydrophobic properties of both fatliquoring agents and dyes on wet colour fastness. M. Nakamura and T. Inatsugi, *Hikaku Kagaku*, **35**, (2), 75, 1989.

The evaluation of the hydrophilic and hydrophobic properties of fatliquoring agents and then effects on the wet colour fastness for chrome-tanned leather were examined in order to establish a guideline for optimising the manufacturing condition to obtain the fast colour dyeing. It is found that the critical surface tension of the leather affects markedly (a) liquid water uptake of leather and (b) the wet colour fastness which was estimated from the amount of dye extracted with alkaline perspiration solution. The improvement in the wet colour fastness took place from increase in hydrophobicity of the leather, to give a low Y_c below 40 dyne/cm by using a fatliquoring agent such as C_{16} monoalkyl phosphate. This improvement is mainly due to the decrease in the interaction between the leather and water regardless of the hydrophilic-hydrophobic balance of dyes.

Functional groups on collagen fiber cross-linked with epoxide. M. Nakamura and M. Masuoka, *Hikaku Kagaku*, **35**, (2), 91, 1989.

The acceleration effect of catalysts on the increase in the shrinkage temperature of acetone-dehydrated hide treated with epoxy resins was reported earlier. In the present study, the treated and untreated hide specimens were analysed by the use of a X-ray photoelectron spectroscopy in order to identify the functional groups of collagen reacted with the epoxide. It showed that in addition reaction of the epoxide with primary amine on collagen is more predominant than that with

the secondary amine. On the basis of previous results the reactivity of the functional group to the epoxide, it was concluded that the cross linkage among collagen fibres introduced mainly with the reaction between epoxide and primary amine and slightly with secondary amine and carboxyl group but not with hydroxyl group.

The need for automation. J.C. Crowther, *Leather*, **19** (4571), 240, 1989.

Although the leather industry is one of the last industries to be fully automated, systems exist which provide the assurance of quality, consistency in a major area of potential process error; wet and chemical processing. These systems allow management to concentrate more intensively on a small range of process variables and potential error. The net result is that the leather industry can show how quality consistency can be maintained to be the same degree as alternative man-made substitutes. At the same time productivity and flexibility is benefited.

High tech. leather making. B. Walker, *World Leather*, Oct./Nov., 8, 1989.

Most tanning processes in the world today contain a mixture of high and low technologies. It is important to make the distinction between genuine high technology and the application of high technology to the control of an operation which may be inherently low technology. Seeds of technology sown in the 1970s are slowly leading to the tannery of the future where computer control and existing new concepts in tanning come together to make a more consistent piece of leather more quickly and more reliably. In this paper the author explores the more important aspects of recent developments which will lead to high-tech leather making.

Tailoring leather for modern shoe making. B. Walker, *World Leather*, Oct./Nov., 22, 1989.

To enable the shoemaker to cope with present day manufacturing and marketing conditions, the advent of more and more automation in shoemaking is calling for a more consistent leather. In the publication the author looks at various areas where tanners should concentrate their efforts to meet this objective.

STATISTICS

JAPAN

Stock levels ('000 head)	Cattle stock	Pig stock	Sheep stock
1979-89	4261	9851	13
1984	4682	10423	22
1985	4698	10718	24
1986	4742	11061	26

Imports wet blue

1984	102 tons	Mainly from the USA, NZ and the UK.
1985	988 tons	
1986	2436 tons	
1987	5673	

Leather garment imports

	Pieces	Unit price (Year)
1984	482,000	15730
1985	496,000	16188

1986	637,000	13586
1987	1849,000	12371

Imports of leather handbags

	Pieces	Unit price (Year)
1984	1288,000	7184
1985	3193,000	3693
1986	4172,000	2885
1987	3027,000	4437

Domestic production of hides & skins

	Cattle	Calf	Pig
1983	1342928	42230	15,584,614
1984	1496348	40678	16,271,532
1985	1542116	34310	17,505,432
1986	1525029	27499	17,947,666
1987	1486221	21606	18,408,291
1988	1442382	18102	18,251,816

Slaughtering

	Cattle & Calf		Pigs		Sheep & Lamb	
	('000 head)	Carcass (Kg)	('000 head)	Carcass (Kg)	('000 head)	Carcass (Kg)
1979-81	1271	337	19293	74	2	23
1984	1537	349	19258	74	4	25
1985	1575	352	20639	74	5	26
1986	1554	360	20995	74	6	28

Imports

	Classic leather styles			Athletic shoes	Leather Uppers
	Pairs	Unit price (Year)		Pairs	Unit price (Year)
1984	1,045,000	5214	From Korea	547,000	5600
1985	1,035,000	5589		1032,000	4688*
1986	1,535,000	4671		2773,000	2898*
1987	2,224,000	4565		9418,000	2475*

* 90% from Korea rest from Taiwan, Hong Kong & USA.
World Leather, Oct/Nov. 1989.

LEATHER NEWS

CARBON DIOXIDE IS KEY TO NEW DELIMING METHOD

A new method of deliming hides in the tanning industry using carbon dioxide may result in higher quality skins, say Swedish company AGA. It is also claimed to reduce environmentally harmful discharges from the tannery and eliminate heavy manual labour from this stage in the process. Patents are pending in over 20 countries. One stage is converting raw hides to quality leather requires the application of slaked lime (calcium hydroxide) to remove hair and other unwanted material. This treatment makes the skin strongly alkaline and the next tanning stage requires it to be neutral, so a weak acid must be applied.

Most tanneries currently use weak solutions of acidic ammonium salts, lactic acid, boric acid or citric acid for deliming. The method developed by AGA in co-operation with Finnish leather manufacturers Viialan Nahka Oy uses a gas which includes carbon dioxide. Leather manufacturers normally avoid carbon dioxide like the plague. Small amounts dissolved in the deliming fluid cause precipitation of calcium carbonate, resulting in ugly patches on the leather — but the AGA method does not produce this problem.

The acid so far used in the deliming has always been supplied in powder form in sacks. When the powder is to be used, the treatment drum is opened and the sack containing, for example, ammonium salts, is lifted up and emptied into the drum, a heavy and monotonous job. Before the powder dissolves it comes into contact with the hides so localised areas receive a high acid concentration and can therefore be damaged. When carbon dioxide dissolves in water the pH value falls evenly in the whole drum, and no localised areas are subject to high levels of acidity.

Deliming with carbon dioxide results in a softer leather with a finer surface structure, say AGA. This is partly due to the fact that carbon dioxide can improve the fat removal process and increase the ability of the leather to bind with chromium. Using carbon dioxide as a deliming medium enables all the calcium to be removed without the leather becoming loose and weakened.

One of the most common types of chemical used for deliming is ammonium salts, eg. ammonium sulphate. Their release, as with other nitrogenous substances, leads to over-fertilisation of lakes and the sea. Excessive algae growth in

recent years is said to have come about due to the amount of nitrogenous waste entering the water. A switch to carbon dioxide would therefore be an important contribution by the leather industry in the fight against pollution.

Introduction of the carbon dioxide additive can be made using existing equipment and at moderate cost. A storage tank is, however, required, preferably outside plant buildings. The additive process can be automated, eliminating heavy manual labour from the process.

Rs. 6,000-CRORE LEATHER EXPORT WITHIN REACH

India has exported leather goods worth Rs. 1,200 crores against the target of Rs. 2,000 crores for 1989-90. During the Eighth Plan the country should be able to export Rs. 3,500 crores of leather and allied products although the country has the possibility of exporting Rs. 6,000 crores of the commodity, according to Mr. Prakash Mahtani, President of Small Scale Leather Industries Federation. Speaking at the golden jubilee fete of the Institute of Leather Technology and Leather Working School at Bombay recently, Mr. Mahtani said that leather was being considered a thrust sector by the Government.

As labour costs in other countries was expensive compared to India, every effort should be made to imbibe sophisticated training to workmen and the institutions like Leather Working School should be given all the encouragement both from the Government and leather trade and industry. The federation would strive to rehabilitate leather training institutions. Prof. Javed Khan, Maharashtra Minister for Education, who inaugurated the jubilee fete, said that the leather industry could easily absorb 200 to 300 students after their training at the institute.

BENGAL TO BOOST LEATHER INDUSTRY

The West Bengal government in its Eighth Plan intends to draw up a special programme to boost the leather industry in the state. A 100-acre leather complex will shortly come up near Santoshpur in south Calcutta and a training institute at Salt Lake. Speaking at the inauguration of a Lexpo trade fair recently, Mr. Buddhadev Bhattacharya, Minister for Urban Development, said that entrepreneurs should come forward and help the state in projecting the potentials of the industry in the state.

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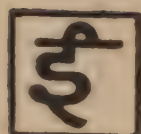
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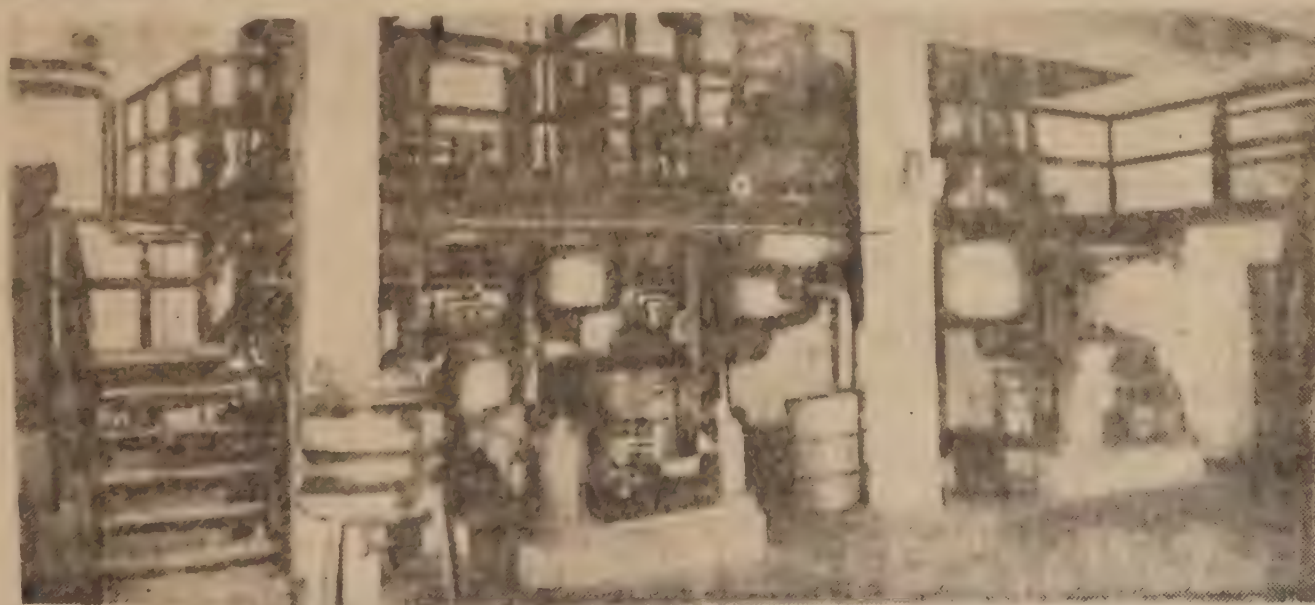
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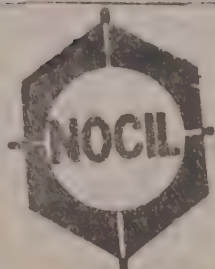
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MARKET INFORMATION

Propylene Glycol Up

Propylene glycol rose by Rs. 3 per kg in the week under review following delay in arrival of imported material. Transport problems resulted in problems in ready availability of materials. Sodium chlorite

was up by Rs. 6 per kg and bromine liquid by Rs. 5 per kg. In the intermediates section anthraquinone traded at Rs. 135 per kg and H. acid was up at Rs. 115 per kg. Activity was moderate.

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Ammonium carbonate (Di)	17.00	Bisphenol-A	70.00	Cream of Tartar (Tech.) China	70.00
Ammonium bicarbonate	5.60	Butyl carbitol	110.00	Citric acid (Belgium) (Resale)	47.00
Ammonium chloride	4.00	Caustic soda (Flakes)	11.00	Citric acid (Indian) (Resale)	43.00
Ammonium nitrate	6.00	Caustic soda (Solid)	12.00	Copper sulphate	25.00
Arsenic white powder	22.00	Caustic soda (Lye)	10.00	Chromic acid	63.00
Acrylamide (Resale)	70.00	Calcium chloride 70% (Solid)	3.25	Ethylene urea	58.00
Barium carbonate	6.00	Calcium chloride 75-80% (fused)	3.50	Ferric chloride (Lumps)	5.50
Bleaching powder (33% Cl)	4.20	Calcium chloride 36% (Anhydrous)	5.00	Ferric chloride (Anhydrous)	16.00
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Bombay Office : 85, C Wing Mittal Towers 8th Floor, Narman Point
Bombay - 400 021 Phone : 2029507 Gram : CELAGAR

Hyflosupercell	20.00	Sodium sulphide 58-60%		Butanol	35
Hexamine (Resale)	35.00	(Flakes) (TCL)	20.00	Benzyl Alcohol	6
Industrial Wax	25.00	Sodium sulphide pure (Flakes)	12.25	Benzyl Chloride	3
Litharge	40.00	Sodium nitrite (Resale) per 50 kg.	730.00	Benzo trichloride	1
Lead Acetate (Tech.)	31.25	Sodium chlorite 80% (Spain)	90.00	Benzoyl chloride	2
Lithopone	17.00	Soda Ash (Tata)	4.80	Bromine Liquid	6
Magnesium chloride		Soda Ash (Birla)	4.50	Chloroform	3
(Crystal)	3.00	Soda Ash (Imp.)	4.50	Carbon Tetrachloride	2
Menthol crystal (Flakes)	900+Ex+ST	Sodium bicarbonate	7.50	Cellosolve	5
Menthol bold	665+Ex+ST	Sodium bisulphite	7.50	Cyclohexanone	5
Menthol crystal cold	700+Ex+ST	Sodium silicate	3.00	Cyclohexanol	58
Magnesium carbonate (Japan)	16.00	Sodium acetate	8.00	Diacetone (Resale)	3
Magnesium carbonate (Indian)	18.00	Sodium alginate	320.00	Diethyl Oxalate	3
Maleic Anhydride (Resale)	41.00	Titanium Dioxide (Anatase)	80+ST	Diethyl glycol (DEG)	32
Mercury (34.5 Kgs)	10,500.00	Titanium Dioxide		Diethyl Phthalate	45
Nickel chloride	110.00	(Rutile - RCR ₂)	105+ST	Diallyl Phthalate	46
Oxalic acid (Resale)	17.00	Tartaric acid	110.00	Dimethyl Phthalate	28
Peppermint oil		Trisodium phosphate	5.50	Diethyl Adipate	52
(Rectified)	195+Ex+ST	Thiourea	83.00	Dibutyl Adipate	42
Potassium carbonate (Indian)	25.00	Urea (Tech.)	2.90	Dipentene	15
Potassium carbonate		Vacuum salt	1.00	Dimethylamine 40%	52
(Imported)	38.00	Zinc Dust	32.00	Dimethylamine 50%	58
Potassium bichromate	32.00	Zinc Oxide	58.00	Ethyl Acetate	20
Potassium phosphate (Mono)	14.00	Zinc chloride powder		Ethyl Acrylate	72
Potassium phosphate (Di)	14.00	(Tech.)	12.50	Ethylene Dichloride	13
Polyvinyl alcohol (No. 117)	115.00	Zinc sulphate	7.00	Ethylene Glycol	38
Polyvinyl alcohol (No. 173)	120.00			Formic Acid (Imp.)	23
Polyvinyl alcohol (No. 208)	150.00			Formaldehyde (Resale)	7
Paraformaldehyde (Resale)	23.00	SOLVENTS	Per Kg.	Glycerine (CP)	55
Phthalic anhydride 36%				Glycerine (IW)	53
(Resale)	24.00	Acetic Acid Glacial (Resale)	14.00	Hydrogen Peroxide 50% (Resale)	26
Pentaerythritol (Resale)	49.00	Acetic Anhydride (Resale)	37.00	Isopropyl Alcohol	29
Paraffin wax	19+ST	Acetone (Resale)	20.50	Isobutyl Alcohol (Resale)	30
Rangolite (German)	90+ST	Adipic Acid	70.00	Monoethanolamine (Resale)	90
Rangolite (Czech.)	70.00	Aceto Acetanilide	55.00	Melamine	60
Sodium sulphate (Fine)	3.70	Aniline Oil	50.00	Methyl Ethyl Ketone	28
Sodium sulphate (Coarse)	3.60	Benzoate Plasticiser	62.00	Methyl isobutyl Ketone	38
Sodium sulphide 50-52%		Butyl acrylate	84+ST	Methyl Acrylate	66
(Flakes)	11+ST	Butyl stearate	45.00	Methylene Dichloride (Resale)	16

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Carbitol	60+ST
Meta Cresol	45.00
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Polyethylene Glycol (No.400)	62.00
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Polyethylene Glycol (No.6000)	85.00
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Chicago Acid (Atul)	355.00
Coach Acid	52.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	140.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
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disulphonic acid	168.00
3,3-DCB (Imp.)	175.00
Gamma Acid (Atul)	205.00
H. Acid (Atul)	115.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	350.00
J. Acid Urea	410.00
K. Acid	125.00
MPDS (German)	185.00

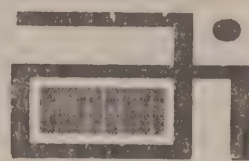
MNA	
Meta Ureido Aniline	
MPD (Local)	
MPD (Japan)	
Naphthenic Acid	
N-Methyl J. Acid	
N-Methyl Aniline	
Naphthalene (Refined)	
Ortho Anisidine (OA) (Imp.)	
Ortho Dichloro Benzene (ODCB)	
OT Base	
Para Dichloro Benzene (PDCB)	
Para Anisidine (PA local)	
PNA	
Para Cresidine (Imp.)	
Para Amino Azo Benzene (India)	
PNCB	
Para Amino Acetanilide	
1-Phenyl 3-Methyl 5-Pyrazolone	
Phenyl J. Acid	
Para Amino Benzoic Acid	
PT Base	
Rhoduline Acid	
Resist Salt 80%	
Resorcinol	
Sodium Naphthionate	
5-Sulpho-Anthranilic Acid	
Sulphanilic Acid	
Sulpho Tobias Acid	
Trichloro Benzene (TCB)	
Tobias Acid	
Metanilic Acid	
MTD	

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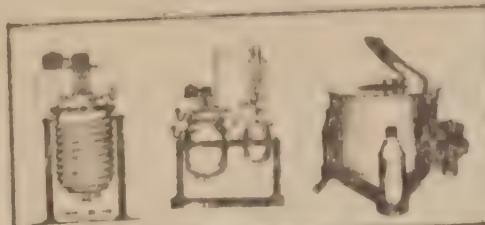
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Bombay Dyes Market

(Prices as on January 23, 1990)

ACID COLOURS		Per Kg.	Brill. Fast Helio 2R	385.85	Red 2B	42
			Brill. Fast Helio 2RS	177.30	Red FB	42
			Brill. Fast Helio BS	116.10	Red Violet FBL	62
Acid Violet 4BS		*190.00	Brill. Violet Extra	181.45	Orange 3R	25
Acid Maroon V		110.00	Blue 2B	102.50	Violet 3R	37
Acid Orange II		112.55	Blue G	220.45	Violet RL	35
Acid Orange ILY		93.85	Sky Blue FB	242.00	Violet 6R	63
Acid Red A		137.00	Copper Blue GR	190.25	Scarlet RR	28
Acid Scarlet 3R		128.35	Fast Greenish Blue GL	114.60	Rubine 3B	28
Acid Red 3BN		*195.00	Developed Black BT	149.95	Rubine CB	44
Acid Red R2R		132.00	Blue NB-2B	348.45	Blue GL	41
Acid Red RS		88.00	Blue NB-2BG	214.70	Blue BGF	80
Acid Patent Blue AS		*280.00	Developed Black NB-GHB	214.70	Navy Blue RE	35
Acid Green V		*375.00	Green B	142.75	Brown 3REL	27
Acid Coomasi Blue		200.00	Green NB-B	218.90	Black GEL	42
Acid Yellow 5GN		65.00	Green 2B-N	218.90	Dark Brown 3B	41
Acid Red PG		85.00	Brown MR	197.40		
Acid Red GRS		78.00	Brown CN	137.00		
Acid Black 10 BX		157.15	Golden Brown G	175.85	BASE COLOURS	
Acid Black BX		126.95	Catechin G	155.70		Per Kg.
Acid Black Wax		135.50	Omega Tan	161.45	Fast Yellow GC	77
Crsein Scarlet MOO		200.30	Catechin GS	102.80	Fast Orange GC	128
Procinil Yellow GS (ICI, UK)		265.00	Black E Hly. Conc.	180.15	Fast Scarlet R	198
Procinil Red GS (ICI, UK)		530.00	Black E Extra Hly. Conc.	180.15	Fast Scarlet RC	128
Procinil Blue RS (ICI, UK)		315.00	Black NB-ER Hly. Conc.	290.50	Fast Scarlet RCR	105
Procinil Scarlet G (ICI, UK)		600.00			Fast Scarlet G	115
Procinil Orange G (ICI, UK)		250.00			Fast Scarlet GN	92
Procinil Rubine (ICI, UK)		550.00			Fast Scarlet GG	77
* To get resale price add 6% tax.					Fast Scarlet GGS	73
					Fast Red B	233
					Fast Red RC	115
					Fast Red R Flakes	158
					Fast Red TR	181
					Fast Red TR Oil	223
					Fast Red RL	251
					Fast Red KB Oil	251
					Fast Bordeaux GP	236
					Fast Garnet GBC	103
					Fast Violet B	548
					Fast Blue BB	566

STR	369.00	Blue H-FRD	305.80	Brill. Purple 2R Hly Conc.	744.25
SPH	336.05	Navy Blue H3R	333.75	Brill. Purple 4R Supra Disp.	604.25
SE	236.00	Blue H 5RX	286.20	Brill. Purple 2R Acra Conc.	779.85
SEL	249.95	Navy Blue M3R	355.70	Blue 2R Powder Fine	675.30
SLB	2002.35	Brill. Blue MR	405.60	Blue BC Acra Con Pdr. Fine	1013.15
SBT	2459.45	Brill. Blue M RX	214.20	Blue BC Conc. Pdr. Fine	713.65
SWG	143.00	Brill. Blue M-G	226.45	Blue R Conc. Pdr. Fine	719.70
SSG	538.65	Blue M 4GD	369.40	Blue Conc. Powder	645.80
SSR	652.60	Navy Blue M RB	341.85	Brill. Blue 2R Hly. Conc.	378.55
		Turquoise M-G	240.30	Blue RR Supra Powder	629.35
		Brill. Blue M GX	516.25	Brill. Blue 2R Supra Disp.	115.65
PROCION COLOURS	Per Kg.	Blue 3R Acra Powder	718.20	Dark Blue 2R Powder Fine	512.65
		Dark Brown H 6R	248.45	Blue BC Supra Disp.	419.65
Golden Yellow HR	207.95	Cobalt Oxide	285.00	Jade Green XBN Powder Fine	555.80
Brill. Yellow H4G	145.65	Green H4BD	287.00	Jade Green XBN Acra	
Supra Yellow H-8GP	168.55	Green H-E4BI	169.80	Conc. Pdr	1026.05
Brill. Yellow HE6G	214.75	Red Brown H IF	143.25	Jade Green 2G Pdr. Fine	533.25
Yellow G-E4R	276.05	Orange Brown H 28	209.05	Jade Green 2G Ptg. Paste	125.40
Brill. Yellow H7G	332.30	Brown M GRN	188.80	Jade Green XBN Ptg. Paste	126.00
Yellow M4R	275.45	Black H-N	314.20	Jade Green 2G Supra Disp.	618.00
Yellow MGR	387.65			Olive D Pdr. Fine	563.90
Brill. Yellow M4G	201.15			Olive Green B Supra Disp.	421.70
Brill. Yellow M8G	366.10	SULPHUR COLOURS	Per Kg.	Jade Green XBN Supra Disp. (N)	327.30
Yellow M3R	244.70			Olive OMW Powder Fine	698.55
Brill. Orange H2R	303.80	Navy Blue	210.35	Olive OMW Supra Disp.	538.05
Brill. Red H7B	157.95	Green G	194.55	Olive D Supra Disp.	361.70
Brill. Orange M2R	313.15	Black Grains Extra	72.25	Olive R Supra Disp.	470.25
Brill. Red H8B	213.55	Black Grains OG	73.70	Olive D. Ptg. Paste	193.00
Brill. Scarlet H RN	245.05	Black GXE Conc.	70.85	Olive Green B Ptg. Paste	199.10
Supra Red H-3BP	179.80	Black GXE	57.90	Olive Green B Acra Conc.	741.10
Brill. Red H-F3B	243.45	Black GXR	69.40	Olive R Acra Conc.	779.85
Brill. Magenta HB	182.00	Black Grains 800	62.80	Brown R Pdr. Fine	869.45
Brill. Red M 5B	160.05	Black EXR Grains	73.70	Dark Brown 3R Fine	826.25
Brill. Red M 8B	218.35	Black EXR Grains 800	59.35	Brown G Supra Disp	582.05
Brill. Pink MB	137.10			Brown 2G Supra Disp	716.10
Brill. Magenta MB	163.65			Brown R Supra Disp	547.35
Brill. Purple H-3R	219.55	VAT COLOURS (ICI)	Per Kg.	Brown BR Powder	867.75
Brill. Purple H-7R	175.40			Dark Brown 3R Ptg. Paste	217.15
Navy Blue H 3R	333.75	Yellow 5G Supra Disperse	561.85	Dark Brown 3F Supra Disp	529.60
Brill. Blue H-GR	406.40	Yellow 5G Acra Conc	818.60	Brown G Acra Conc.	967.95
Brill. Blue H5G	207.95	Gold Orange 3G Pdr. Fine	1158.45	Brown M. Powder Fine	768.80
Blue H 5RX	286.20	Brill. Orange 6R Pdr. Fine	624.35	Grey M. Supra Disp.	585.45
Brill. Blue H 7G	213.95	Gold Orange 3G Supra Disp	693.85	Blue BC Acra Conc. Pdr. Fine	762.70
Brill. Blue H 7RX	358.15	Brill. Orange 6RX Powder	394.30	Direct Black AC Supra Disp.	415.75
Turquoise HA	265.05	Brill. Red 3B Pdr. Fine	1214.15	Direct Black AC Pdr. Fine	574.70
Supra Blue H-3RP	595.30	Brill. Red 3B Supra Disp	867.45	Direct Black CH Supra Disp.	490.45
Supra Turquoise H 2G P	181.50	Brill. Purple 3R Acra Powder	827.05	Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: JAN. 19, (NNS) Mercury suffered a setback of Rs. 700 at Rs. 11,200 per flask in the Delhi chemicals market during last week thanks to profit taking selling by stockists in view of lower advices from Bombay. Buyers were out of the market. In the absence of demand from textile units, chatkolite and sufolite declined further by Rs. 2.50 and Rs. 3 at Rs. 53.50 and Rs. 67 per kg respectively, while rangolite Germany moved up by Rs. 2 at Rs. 85 due to fall in import from Germany. In spite of good seasonal demand by gur and khandsari manufacturers, sodium hydrosulphite ruled quiet at Rs. 34/36.50 because of comfortable stock position in the market.

Sodium nitrite jumped up sharply from Rs. 800/900 to Rs. 1150 per 50 kg on rumours of hike in its prices by manufacturers. Soda bicarb and soda ash Tata advanced by Rs. 2/9 at Rs. 287 and Rs. 355 per bag owing to paucity of supply. Citric acid recorded a rise of Rs. 25/50 at Rs. 2,100/2,375 owing to sustained demand by consumers alongwith higher advices from Bombay. As a result of increased demand from paneer manufacturers, tartaric acid France resumed higher by Rs. 100

at Rs. 13,700 while desi tartaric acid Trishul Marka ruled quiet at Rs. 4,150 per 15 kg. Paraffin wax hardened by Rs. 10 at Rs. 860 in view of increased demand by candle manufacturers. Titanium dioxide Anatase moved up by Rs. 3 at Rs. 84 on account of increased demand by plastic units. K-Brand titanium dioxide also sold higher at Rs. 75 instead of Rs. 74 while turnover was poor in RC-822 and RCR-2 on withdrawal of demand.

On reports of arrivals of about 3000 kg of menthol from Sambhal, Moradabad, Rampur, Chandausi & Amroha areas of U.P. during the week and fall in demand by consumers, menthol flake and bold dropped by Rs. 17/20 at Rs. 345 & Rs. 385 per kg. Menthol medium also slumped from Rs. 390 to Rs. 375.

Due to poor enquiries mentha oil declined by Rs. 15 at Rs. 245/265 and DMO ruled quiet at Rs. 125. Naphthalene balls drifted lower by Rs. 50 at Rs. 1,450 for want of support while caustic soda rose by Rs. 5 in view of stopped supply by Modi companies. Later prices turned easy and quoted at Rs. 535 thanks to better inflow by Gwalior Rayon. No change was reported in dyes and colours.

Menthol Flake (Per Kg.)	34
Menthol Oil (Per Kg.)	245/265
Glycerine (Per Kg.)	55/58
Sodium Silicate (Per quintal)	275/350
Hexamine (Per Kg.)	38
Acetic Acid Glacial (Per Kg.)	15
Copper Sulphate (Per quintal)	2,400/2,500
Formic Acid (Per Kg.)	24
Formaldehyde (Per Kg.)	8
Hydrogen Peroxide (Per Kg.)	25.75/26
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28
Acid Slurry Hard (Per Kg.)	38
Phosphoric Acid (Per 50 Kg.)	1,050
Potassium Nitrate (Per quintal)	900/1,200
Potassium Permanganate (Per 50 Kg.)	2,800/3,200
Sodium Bichromate (Per 50 Kg.)	1,575/1,600
Trisodium Phosphate (50 Kg.)	600
Titanium Dioxide Anatase (Per Kg.)	84
Titanium Dioxide RC-822 (Per Kg.)	95
Titanium Dioxide K-Brand (Per Kg.)	75
Titanium Dioxide RCR-2 (Per Kg.)	105
Zinc Oxide (Per metric tonne)	42,000/48,000
Phenol Carbolic Acid (Per Kg.)	37
Carbon Tetrachloride (Per Kg.)	24
Chloroform (Per Kg.)	28
Sodium Sulphate (Per metric tonne)	3,400/3,700
Naphthalene Balls (Per 50 Kg.)	1,450

DYES & COLOURS (Per Kg.)

Naphthol AS	175/201
Naphthol ASG	180/295
Naphthol ASBS	210/248
Naphthol ASTR	275/360
Naphthol ASOL	210/238
Naphthol ASBO	195/260

DIRECT DYES (Per Kg.)

Black E. Conc.	120/176
Diazo Black B.T.	105/147
Green B	90/140
Blue 2-B	60/101
Blue 2-B 225% (JNR)	125
Sky Blue FB	160/235
Basic Auramine	55/110
Basic Rhodamine	300/425
Basic Methylene Blue	100/180
Basic Violet	165/210
Basic Malachite Green	175
Acid Orange	75/111
Congo Red H/C	75/120

(DELHI MARKET RATES AS ON JANUARY 19, 1990)

Ammonia Bicarb (Per 25 Kg.)	149.00	Rangolite (Per Kg.)	85.00
Mercury (Per flask)	11,200.00	Tartaric acid (Imp) (50 Kg.)	13,700.00
Soda ash (Per bag)	340/355.00	Sufolite (per Kg.)	67.00
Ammonium Chloride (50 Kg.)	110/180.00	Chatkolite (per Kg.)	53.50
Caustic soda flakes (50 Kg.)	535.00	DMO	125.00
Citric acid (Per 50 Kg.)	2,100/2,375.00	Boric acid Technical (Per 50 Kg.)	1,350.00
Stable Bleaching Powder		Paraffin Wax (Per 50 Kg.)	860.00
Shriram (Per 25 Kg.)	101.00	Tartaric Acid (Indian Per 15 Kg.)	4,150.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00	Borax Granular (Per 50 Kg.)	835.00
Stable Bleaching Powder		Borax Crystal (Per 50 Kg.)	835.00
Maruti (Per 25 Kg.)	90.00	Sodium Nitrite (Per 50 Kg.)	1150.00
Stable Bleaching Powder		Sodium Nitrate (Per 50 Kg.)	450.00
Modi (Per 25 Kg.)	92.00	Camphor Thal (Per Kg.)	104.00
Sodium Bicarbonate (50 Kg.)	287/290.00	Camphor Powder (Per Kg.)	95.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50	Menthol Bold (Per Kg.)	385.00
		Menthol Medium (Per Kg.)	375.00

Madras Market

The downtrend in prices is continuing. With the availability of butanol from Oswal Agro's Bombay plant (formerly Union Carbide plant) the prices of butanol have come down sharply. So also the prices of butyl acetate and dibutyl phthalate where butanol is used as a raw material. Prices of other solvents have also

come down due to various reasons but primarily due to availability of imported stocks which had forced the prices down.

The prime sufferers are MEG, DEG, MEK, methylene chloride, methanol etc. where imports have been very heavy during the recent times.

Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	350.00
Oxalic Acid (per kg)	20.00
Paraffin Wax (per kg)	17.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.50
Polyvinyl Alcohol Powder (per kg)	130.00
Pentaerythritol (per kg)	49.00
Phthalic Anhydride (per kg)	29.00
Soda Ash (TAC) (per 75 kgs)	354.00
Soda Ash (TATA) (per 75 kgs)	354.00
Sodium Bicarbonate (TATA) (per 50 kgs)	370.00
Sodium Silicate (per MT)	3,400.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	220.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	89.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	52.00
Zinc Chloride Powder (per kg)	14.00
Zinc Sulphate (per kg)	7.00

(MADRAS MARKET RATES AS ON JANUARY 20, 1990)

Acetic Acid Glacial (per kg)	14.50	Calcium Carbonate (Precipitated) (per MT)	5,000.00	Acetone -- HOCL (per kg)	19.50
Aluminium Sulphate Iron free (per MT)	4,000.00	Citric Acid (per kg)	48.00	Butanol (per kg)	34.00
Ammonium Bicarbonate (per 25 kgs)	145.00	Copper Sulphate (per kg)	24.00	Butyl Acetate (per kg)	42.00
Ammonium Chloride (per MT)	3,000.00	Cresylic Acid 98-99% (per kg)	130.00	Benzene (per lit)	15.00
Acid Slurry (per kg)	31.00	Pure Para Cresol 96% (per kg)	85.00	Cellosolve (per kg)	50.00
Barium Carbonate (per kg)	9.00	Meta Para Cresol 42% (per kg)	50.00	Carbon Tetra Chloride (per kg)	23.00
Barium Chloride (per kg)	8.00	Formic Acid (per kg)	26.00	Chloroform (per kg)	28.00
Boric Acid Technical (per kg)	24.00	Formaldehyde (per kg)	8.00	Diacetone Alcohol (per kg)	30.00
Bleaching Powder (per 50 kgs)	220.00	Glue Flakes (per kg)	15.00	Diethylene Glycol (per kg)	38.00
Borax (per 50 kgs)	700.00	Glycerine I.W. (per kg)	45.00	Dichloroethane (per kg)	18.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	10,800.00	Hydrosulphite of Soda (TCPL) (per kg)	36.00	Di-octyl Phthalate (per kg)	44.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	10,800.00	Hydrosulphite of Soda (IDI) (per kg)	40.00	Di-N-butyl Phthalate (per kg)	44.00
Calcium Chloride 70% Solid (per MT)	3,000.00	Hydrosulphite of Soda (BASF) (per kg)	40.00	Ethyl Acetate (per kg)	22.00
Calcium Chloride Anhydrous (per MT)	5,750.00	Hexamine (per kg)	30.00	Isopropyl Alcohol (per kg)	28.00
Calcium Carbonate (Activated) (per MT)	6,000.00	Hyflosupercell (per kg)	19.00	Methanol (per kg)	10.00
		Hydrogen Peroxide (per kg)	31.25	Methylene Chloride (per kg)	20.00
		Litharge (per kg)	40.00	Methyl Ethyl Ketone (per kg)	34.00
		Lead Acetate (per kg)	38.00	Methyl Isobutyl Ketone (per kg)	42.00
		Magnesium Carbonate (per kg)	16.00	Phenol (per kg)	36.00
				Sorbitol (per kg)	15.00
				Triethanolamine (per kg)	95.00
				Trichloroethylene (per kg)	26.00
				1-1-1 Trichloroethane (per kg)	29.00
				Turpentine (per lit)	16.50
				Toluene (per lit)	16.00
				Xylene (per lit)	?

International Bulk Chemical Prices

Spot Prices are as on January 3, 1990

Naphtha prices have risen further to \$186-188/ton cif NWE due to the cold snap which has disabled the US Gulf refinery industry. Ethylene prices have jumped to \$350-370/ton cif NWE due to the temporary closure of up to 20 US crackers. Propylene remains relatively stable at DM560-580/ton cif NWE and is hardly being affected by events in the U.S. Butadiene prices are nominal at the level \$540-560/ton fob NWE. Benzene prices have firmed to \$390-400/ton fob

NWE after dropping to \$360/ton fob NWE, over the holiday period. The market is rising due to fears over the number of US shutdowns. Toluene has also been strongly influenced by events in the US, with numbers ranging from \$270-290/ton, although some sellers are quoting numbers above \$300/ton.

Paraxylene continues to drift away, with prices nominal at \$450-470/ton fob NWE. Orthoxylene prices remain stable

at \$295-305/ton fob NWE. Xylenes have seen little activity, with prices stable at \$260-265/ton for solvent grade and virgin at \$260-270/ton fob NWE. Styrene continues to soar, with T1 prices up to \$970-1,040/ton fob NWE. Methanol T1 prices have jumped to \$95-100/ton cif NWE, due to strong demand and continued production difficulties hampering supplies. T2 production is now in the range of DM205-210/ton fob NWE.

Product	European Spot price range \$/ton	US price range \$/ton
Ethylene	350-370 (cif)	463 (spot)
Propylene (100% basis)	327-339 (cif)	276-286 (spot)
Butadiene	540-560 (fob)	573 (spot)
Benzene	390-400 (fob)	416-419 (spot)
Toluene	270-290 (fob)	300-306 (spot)
Xylenes (virgin)	260-270 (fob)	264-266 (spot)
(solvent)	260-265 (fob)	n.a.
Styrene	1060-1080 (T2)(fob)	969-992 (spot)
	970-1040 (T1) (cif)	
Paraxylene	450-470 (fob)	n.a. (spot)
Orthoxylene	295-305 (fob)	n.a. (spot)
Ammonia	88-102 (cif)	n.a.
Methanol	120-125 (T2)(fob)	n.a.
	95-100 (T1)(cif)	
Naphtha	186-188 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx sailing date (5)
27/1	Supanya (Voy-32)	Samrat	Longbeach; Oakland; Seattle; Los Angeles; San Francisco; Philadelphia; Savannah; Charleston; Batliore; Norfolk; New York; Boston; St. John; Vancouver; Montreal; Toronto; New Orleans; Houston. (Carting at M.B.)	31/1
		U.L.A./	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax, Montreal; Toronto; S. American and West Indian Ports. (Carting at M-171/173 C.D.).	
		E.S.P.L.	Longbeach; Charleston; New York; St. John; Norfolk; Oakland; Vancouver (B.C.); Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; Longview; Los Angeles; New Orleans; Philadelphia; Portland; San Diego; Mexico City; San Francisco; Siouxfall; Sacramento; Stockton; Halifax; Toronto; Savannah; Tacoma; Miami and all other destinations. Also Caribbean ports. (Carting at Mallet Bunder).	

	(2)	(3)	(4)	(5)
		Trident/	S. American; Caribbean and Central American ports. (Carting at T.P. No. 4).	
1/1	Uni Pioneer (Voy-022)	Arebee Greenways	S. American Ports. (Carting at M-Jetha Cotton Depot). New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Alameda; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations and Caribbean ports. (Carting at G/H Cotton Depot).	4/1
9/1	Seacrest Achiever (Voy-206)	Seaspeed/ Oceanic	New York; Baltimore; Norfolk; Savannah; Charleston; Houston and S. American ports. (Carting at Hay Bunder No. 5). New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast and S. American ports. (Carting at Wadi Bunder No. 3).	4/2
30/1	Leniskiy Pioner (Rus)	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 3).	4/2
30/1	Hoegh Duke (Br)	Patvolk	Montreal and Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans; & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	4/2
31/1	Maersk Clementine (Sing)(V-9003)	Volkart Fleming	New York; Philadelphia; Baltimore; Norfolk; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston; Toronto; Montreal; Chicago; Atlanta; Denver; Dallas; Wilmington; Milwaukee; Detroit; Minneapolis; Memphis; Nashville; Cleveland; Phoenix; Boston; Los Angeles; Vancouver; Seattle; San Francisco; Portland; Longbeach; Mexican and S. American ports. (Carting at M.O.D. No. 2).	4/2
6/2	Sam Houston (Ame)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	7/2
2/2	Medipas Star	Samrat/ Hindustan/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; P. Lauderdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto and S. American Ports. (Carting at M-171/173 Cotton Depot for L. Triest) (Carting at M.O.D. No. 1 for Samrat and Hindustan).	7/2
31/1	Maersk Clementine	V. Fleming	Lagos/Apapa; Dakar; Freetown; Monrovia; Lome; Cotonou; Douala; Tema. (Carting at M.O.D. No. 2).	4/2
26/1	Anika Oltmann	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Logos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).	1/2
27/1	Supanya	U.L.A./ Trident	Lagos/Apapa; Abidjan; Lome/Matadi. (Carting at M-171/173 C.D.). Tema/Lome; Lagos; Matadi; Lobito; Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Carting at T.P. No. 4).	31/1
29/1	Seacrest Achiever	Seaspeed	West African ports. (Carting at Hay Bunder No. 5).	4/2
2/2	Medipas Star	L. Triest	With T.P. Lagos/Apapa; Abidjan; Dakar; Douala; Cotonou; Nouakchott; Libreville; Tema; Matadi; Conakry; Freetown. (Carting at 171/173 Cotton Depot).	7/2
27/1	Supanya	Kanika	Antwerp; Rotterdam; Hamburg; Le Havre; Genova; Gothenburg; Stockholm; Copenhagen; Oslo; Helsinki; London; Felixstowe; Tilbury. (Carting at T.P. No. 3).	31/1
26/1	Anika Oltmann	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam. Also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all destination in U.K.; Benelux Germany; Italy; France; Switzerland and Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at M.O.D. No. 1 for Samrat & Hindustan).	1/2
25/1	Baltik (Yug)	Oceanic	Jeddah; Rijeka.	5/2
28/1	Al Karim (Malta)	Samarth	Jeddah; Hodeidah; P. Sudan.	31/1
29/1	Seacrest Achiever (V-206)(Ger)	Merzario/	Jeddah; Hodeidah; P. Sudan; Revanne; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D. No. 2).	4/2

(1)	(2)	(3)	(4)	(5)
		Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; Le Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 5).	
		L. Triest/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting at M-171/173 C.D.).	
		Oceanic/	P. Said; Limassol; Alexandria; Casablanca; Tripoli; Livorno; Genoa; Mersin; Iskendren; Izmir. (Carting at Wadi Bunder No. 3).	
		Killick	Jeddah; Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona and Scandinavian ports. (Carting at M-178/180 Cotton Depot).	
30/1	Oyster Bay	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	2/
30/1	Leninskiy Pioneer (Rus)	Transocean/	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmao; Leeds. (Carting at TP No. 3).	4/
		I.S.S.Co.	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven & Scandinavian ports via Hamburg. (Carting at Wadi Bunder No. 3).	
2/2	Medipas Star	L. Triest/	Jeddah; Barcelona; Marseilles; Genoa; Leghorn; La Spezia; Naples with TP Trieste; Venice; Ravenna; Bari; Koper; Rijeka; Las Palmas; Santacruz; De Teneriffe; Malta; Limassol; Alexandria; Casablanca; Tunis; Algiers; Lattakia; Tripoli; Benghazi; Oran; Point E Pitre; Port De France. (Carting at M-171/173 Cotton Depot).	7/
		Samrat / Hindustan/	Barcelona; Marseilles; La Spezia; Livorno; (Leghorn); Genoa; Naples; and other Italian ports and FCL only Beirut; Alexandria; Valletta; Lattakia; Mersin. (Carting at M.O.D. No. 1 for both).	
		Merzario	Genoa; Leghorn; La Spezia; Naples; Salerno; Marseilles; Barcelona. (Carting at M.O.D. No. 2).	
6/2	Sam Houston	M.S.P.L.	Aqaba; Assab; P. Suez; (Alexandria). (Carting at P/Q-PD).	7/
27/1	Supanya	Silvership	Chittagong. (Carting at Timber Pond No. 3).	31/
27/1	Supanya (V-32)	Samrat/	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo. (Carting at Mallet Bunder).	31/
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at T.P. No. 4).	
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese ports. (Carting at M-171/173 Cotton Depot).	
		E.S.P.L.	Singapore; Hongkong; Bangkok; Jakarta; Kaohsiung; Keelung; Penang; P. Kelang; Kota; Kinabulu; Kulaubelati; Bintulu; Kuching; Labuan; Vietnam (P.R.C.). (Carting at Mallet Bunder).	
		I.M.E./	Singapore; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at Wadi Bunder No. 3).	
		M.C.S./	Singapore; Hongkong; Keelung; Kaohsiung; Jakarta; Surabaya; Bangkok; Penang; P. Kelang. (Carting at H.B. No. 4 for M.C.S.).	
		Kanika/	Bangkok; P. Kelang; Djakarta; Keelung; Busan; Hongkong. (Carting at T.P. No. 3).	
		Silver Ship	Singapore; Far East & Japan ports. (Carting at T.P. No. 3).	
28/1	Lyudmila Stal	Transocean	Singapore; Main Japan ports.	6/2
28/1	Uni Pioneer (V-022)(Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).	4/2
6/2	Sam Houston	M.S.P.L.	Singapore. (Carting at P/Q-PD)	7/2
6/2	Kamunik (Yug)	Depe	Hongkong; Keelung; (Kaohsiung); Kobe; Yokohama; Tokyo; Busan.	13/2
27/1	Supanya (V-32)	Samrat/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie. (Carting at M.B.).	31/1
		Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttelton. (Carting at T.P. No. 4).	
		Arebee/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at M-Jetha	Cotto
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at CFS Cotton Avenue).	Depo

	(2)	(3)	(4)	(5)
Port	Meghpal (Pan)	Kanika/	Brisbane; Sydney; Melbourne; New Castle; Adelaide; Fremantle; Auckland; Wellington; Lyttleton. (Carting at Timber Pond No. 3).	
9/1	Seacrest Achiever (V-206)	Silver Ship	Sydney; Melbourne; Brisbane; Adelaide; Fremantle; Auckland; Wellington; Lyttleton; Chalmers. (Carting at T.P. No. 3).	
		Unimarine	Dammam.	31/1
		Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).	4/2
		Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain. (Carting at 14-VD for Merzario).	
		L. Triest/	Dubai; Dammam; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; Bahrain. (Carting at 171/173 Cotton Depot for L. Triest).	
		Seaspeed	Dubai; Dammam; Bahrain; Kuwait; Doha. (Carting at H.B. No. 5).	

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
30/1	Hoegh Duke	Patvolk	U.S.A.
7/2	Ind. Progress	I.S.S. Co.	U.K. Cont.
3/2	Mota Mutyara	Mackintosh	China/F. East
6/2	Kamnik	Depe	Far East
30/1	Leninsky Pioneer	Transocean/I.S.S.Co.	U.K. Cont.
2/2	Medipas Star	L. Triest/Hindustan	Med. Ports.
5/2	S/o. Madhya Pradesh	S.C.I.	Med. Ports.
6/2	Sam Houston	M.S.P.L.	U.S.A.

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PLEASE LET US KNOW WHAT NEW FEATURES YOU WOULD LIKE US TO INCORPORATE OR WHICH FEATURES YOU FIND REDUNDANT. YOUR PROMPT REPLY WILL BE HIGHLY APPRECIATED.

Address all letters to

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CHEMICAL WEEKLY

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Materials Imported

RUG MATERIALS IMPORTED BOMBAY

30.11.89

(Continued from previous issue)

L-LYSINE MONO HCL USP: From Japan: Jet Pharm Ltd., 500 Kgs., Rs. 45,174.

PHENOBARBITONE IP: From SSR: Medi Pharma Drug House, 490 Kgs., Rs. 82,937.

PHENYL PROPANOLAMINE HCl USP 21/BP 88: From Japan: Bangalore Bhar & Research Lab, 400 Kgs., Rs. 1,50,025.

POLYSORBATE USP: From Japan: U.S. Vitamins (India), 5,000 Kgs., Rs. 1,84,263.

MATERIALS IMPORTED BOMBAY

(From 4.12.89 to 6.12.89)

ACETANILIDE: From Japan: Ciba-tul Ltd., 8,700 Kgs., Rs. 21,33,657.

ACETIC ACID GLACIAL: From USA: Bharat Electronics Ltd., 498 Kgs., Rs. 37,435; Greaves Semiconductors Ltd., 131 Litres, Rs. 10,908.

ACRYLAMIDE: From Japan: A One Dyes & Chemicals Ltd., 2,000 Kgs., Rs. 56,862; Bhadresh Chemicals, 10,200 Kgs., Rs. 4,34,055; Kohi-moor Waterproof Works, 1,500 Kgs., Rs. 3,81,468; Paper Plast, 300 Kgs., Rs. 76,294; Swan Products, 200 Kgs., Rs. 55,863; Synth Chem Inds., 3,000 Kgs., Rs. 7,62,936.

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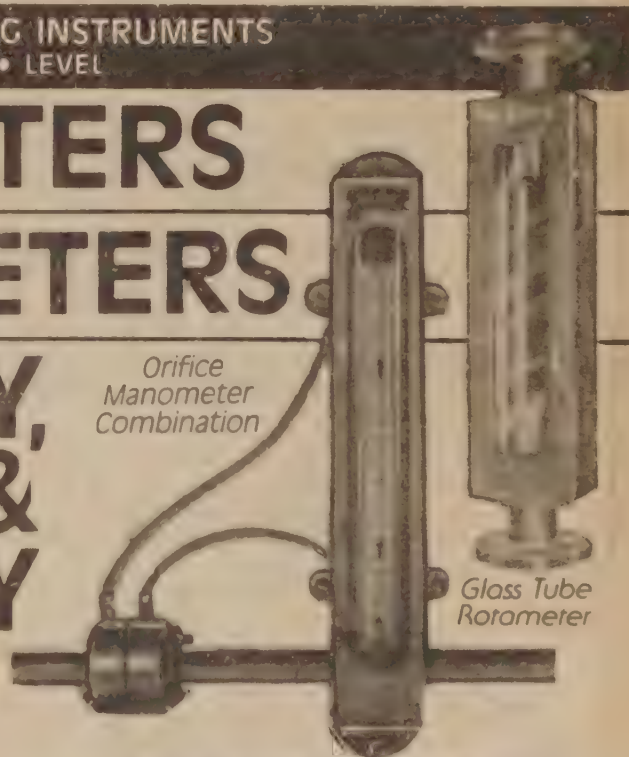
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